Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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FRED A. SEATON, SECRETARY

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.31 PREPARATION OF CRYSTALLINE TRANS-TRANS METHYL LINOLEATE HYDROPEROXIDE

Banks, A.; Fazakerley, S.; Keay, J. N.; and Smith, J. G. M. (Torry Research Station, Aberdeen, Scotland)
Nature 811, (September 12, 1959)
Torry Memoir No. 22

A method has been worked out for the continuous separation of the hydroperoxide of oxidizing methyl linoleate; the oxidation level of the latter being maintained at about 2 percent. The product obtained has been purified and ultimately crystallized.

Methyl linoleate, prepared by debromination of tetrabromostearic acid, was oxidized in solution in petroleum ether (b.p. 60° to 80°C.) with oxygen gas, the resulting peroxide being continuously extracted from solution by finely dispersed 85 percent aqueous methanol saturated with petroleum ether. In this way, the peroxide value of the oxidizing methyl linoleate was kept within the range 55 to 70 (ml. 0.002 N sodium thiosulphate per gm.), and the tendency for the reaction to proceed beyond the hydroperoxide stage was reduced to a minimum.

The methanol solution obtained usually contained equal weights of hydroperoxide and unchanged ester, which were then separated by partition between 85 percent aqueous methanol and petroleum ether (b.p. 60° to 80°C.). The product finally obtained from the combined methanol fractions was a pale yellow oil with a peroxide value of 3,400 as determined iodometrically, which is known to give higher values than theoretical, and an E (1 percent, 1 cm.) of 810 at 231.5 mμ in ethanol (ϵ = 26,400).

An infrared spectrum of the product showed a strong band at 2.92 μ (the hydroperoxide group) (Lemon, Kirby and Knapp 1951), a strong maximum at 10.10 μ and a weaker one at 10.52 μ, together

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 Reprinted in whole

1.0112 THE JAPANESE AND RUSSIAN TRAWL FISHERY IN THE BERING SEA

Alverson, Dayton L. (Exploratory Fishing and Gear Research Base, U. S. Bureau of Commercial Fisheries, Seattle 2, Washington)
Western Fisheries 60, 12-14, 30-31 (April 1960)

The arrival in 1959 of a large, Russian trawl fleet in the eastern Bering Sea stimulated considerable speculation concerning the possible implications that Soviet fishing activities may have on United States interests in this area. The Bering Sea is an area of nearly 878,000 square miles, being approximately 800 miles long from north to south and 1,200 miles across the southern region. In the eastern northeastern region, there is an extensive continental shelf extending west from the Alaska coast. Approximately 409,000 square miles of the Bering Sea are at depths less than 100 fathoms. The western Bering Sea by contrast, is relatively deep, with depths in excess of 1,500 fathoms being encountered.

With the exception of the recent innovation of the halibut line fisheries, the United States and Canadian fishermen have not actively exploited groundfish stocks in the eastern Bering Sea. Although Japanese and Russians have been active in this region, there has been some physical separation of the fleet--the Japanese have operated more in the area southeast of the Pribilof Islands, whereas the Russian trawlers have been working more to the north in the area off Kuskokwim Bay.

The Japanese and Russians are both conducting mothership operations that requires the fishing vessels to deliver their catches to support vessels for further processing. Some units of both fleets, however, operate independent of motherships. The Japanese are using four fishing techniques including (1) Danish seining, (2) bull trawling, (3) conventional otter trawling, and (4) stern trawling. The average Japanese trawler is somewhat over 100 feet in length and the stern trawler exceeds 200

(over)

 ABSTRACTER: Fredrick Wathne

0.7 FACTS ABOUT FOOD SUPPLIES

Nicol, Hugh (Chemistry Department, West of Scotland Agricultural College, Glasgow, C. 2)
Food Technology 14, 4-6, 8, 10, 12, 14, 16, 18 (March 1960)

When the scientific facts about food are assembled, they follow a few general principles, there being hardly more than half-a-dozen basic ones. Being truly basic, these principles apply to both land and sea.

All foods come from plants. Sometimes food plants are without chlorophyll, but photosynthesizing green plants are the source of food for all animals, including fish.

The bulk nutrients contributed by plants are carbohydrates, fats, and proteins. For brevity, the author does not extensively discuss vitamins and minerals, and he considers fats along with carbohydrates. He thus treats carbohydrates and proteins in simple contrast.

The nutrition of plants is cyclic in nature. The cycle can be entered at any point, but it is usual to begin with solar energy and photosynthesis. Two primary adjuncts of the life cycle are:

1. All fertilizers and manures, without exception, are salts directly soluble in water or become ionic through biological and other processes. Unless converted into simple ions, no fertilizers can be used by plants.

2. The life cycle results in an accumulation of soil organic matter called humus. This organic matter has or attains some equilibrium value in its ratio of total carbon to total nitrogen.

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 ABSTRACTER: F. Bruce Sanford

1.57 TECHNICAL NOTE NO. 55 - RECOMMENDED PRACTICES FOR PROCESSING CHILLED AND FROZEN WHITING

Tenny, R. D. and Sereno, M. N. (U. S. Bureau of Commercial Fisheries, Gloucester, Massachusetts)
Commercial Fisheries Review 22, 6-9 (May 1960)

Whiting (Merluccius bilinearis) spoil easily so that even though large quantities of this species are landed annually, the value of the fishery is relatively small. A study was undertaken to determine what practices are necessary in order to retain the initial high quality of the freshly caught whiting. The immediate objective of the study was to recommend practices for processing chilled and frozen whiting that would: (1) assist in upgrading product quality, (2) increase consumer acceptance, (3) increase value, and (4) act as a check list for fisherman, processor, and wholesaler.

The information for developing these recommendations was collected from various organizations that represent the whiting industry. Plants were visited and samples were obtained and evaluated in order to correlate quality and handling practices. The information that was collected, together with the comments from members of industry, was evaluated in the light of the latest methods of quality control and used as the basis for recommended practices.

Recommended practices. --(1) Immediately after capture, the fish shall be chilled and maintained in a thoroughly chilled condition by being packed in adequate amounts of clean, finely crushed or flaked ice. Fillets, and headed and gutted whiting shall be processed only from good- or excellent-quality fish; (2) in the production of fillets, they shall be cut from fish that were scaled and washed in cold brine, chlorinated sea water, or cold, potable water. In the production of the headed and gutted product, the whiting shall be headed, thoroughly scaled, and eviscerated in accordance with good commercial practice. (3) The flesh of fillets shall be firm and resilient, and white, pinkish

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 ABSTRACTER: Kathryn L. Osterhaug

OXIDIZING METHYL LINOLEATE

BASIC FOOD FACTS

JAPANESE AND RUSSIAN TRAWL FISHERY

PROCESSING FRESH WHITING

0.7 (Cross Reference: 6.190)

The C:N ratio of soil is a factor determining productivity. Manipulating the C:N ratio is a basic feature of soil management.

The prime things about food for any animal are that the day's diet must contain a certain minimum of protein and that that sufficiency of protein must be maintained about three times daily.

That necessary minimum proportion of protein is roughly 16 percent of the food.

Cereals have insufficient protein, and by themselves cannot maintain life. The ancient Egyptians, for instance, had fish and lentils, and possibly their barley was unusually rich in protein. In general, a human diet that does not contain either legumes or protein-rich animal products from land, sea, or river leaves an unbridgeable gap between its content of protein and the vital minimum.

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white, or off-white. The fillets shall be free of any tissue that is chalky, jellied, diseased, parasitized, or otherwise abnormal. Headed and gutted whiting shall be free of scales, gills, viscera, and spawn.

(4) Fillets that are to be frozen shall be packaged in 1-pound capacity cartons with or without inner wrap or shall be wrapped in amounts of 1 to 1½ pounds with cellophane or other suitable packaging material and shall be packed in 5- or 10-pound capacity cartons. (5) Packages of fillets or of headed and gutted whiting that are to be shipped in the unfrozen state shall be kept at temperatures of 32°F. to a maximum of 36°F. by packing them in boxes with ice or by keeping them in a room maintained at 32°F. to a maximum of 36°F. Packages of fillets or of headed and gutted whiting are to be shipped in the frozen state shall be placed in the freezer within 30 minutes after being packaged. The products shall be frozen at a freezer temperature of -10°F. or lower and then shall be maintained in storage at a temperature of 0°F. or lower. (6) Fresh whiting shall be transported in either refrigerated or nonrefrigerated vehicles. During transportation, the whiting shall be kept at temperatures not higher than 36°F. by packing the containers of whiting in boxes with ice, and re-icing enroute if necessary, or by shipping them in vehicles that have a storage space maintained at 32° to 36°F. Frozen whiting shall be transported in refrigerated units. The refrigeration must be turned on and the temperature reduced to 0°F. or lower prior to loading, and the proper temperature of 0°F. or lower shall continuously be maintained during the entire time of shipment.

0.31

with indications of the presence of a carbonyl group, in addition to the ester. The material thus appeared to be a mixture of cis and trans conjugated diene hydroperoxides contaminated with a small quantity of decomposition products.

The hydroperoxide was purified further by two crystallizations from petroleum ether (b.p. 40° to 60°C.) at -35° and a further two from ethanol at -76° to yield a compound with an E (1 percent, 1 cm.) of 890 at 231.5 mμ (ϵ = 29,000). Further crystallization from ethanol produced no change in the extinction coefficient at 231.5 mμ. The infrared spectrum showed that carbonyl decomposition products had been removed by crystallization. In addition although there was strong absorption at 10.11 μ there was no band at 10.52 μ, which indicates that the product was pure conjugated trans-trans methyl linoleate hydroperoxide.

Experiments verifying the predominance of the 9- and 13-hydroperoxides in the product (Bergstrom 1945) are at present being concluded and will soon be published together with details of the experiments outlined in this communication.

The work described in this paper was carried out as part of the programme of the Department of Scientific and Industrial Research.

1.0112

feet. The motherships, used as reduction factories, are in excess of 9,000 tons. These vessels can process 500 tons of fish per day.

The Russian catcher fleet appears to be composed of stern sideset trawlers ranging in size from 110 to 130 feet. Some distant sea trawlers approximately 180 feet in length are also in operation. Both types of vessels operate as complements to motherships. Support vessels of the Russian fleet include oilers, refrigerators, tugs, and cargo vessels. The main support vessels are 240-foot refrigerators, which shuttle the catches to the Soviet Union.

Fish production by the Japanese groundfish fleets in the Bering Sea ranged from 23 million pounds in 1955 to 104 million pounds in 1958. Pollack and flounder are the principle species taken. The Japanese have stated that their production goal for the 1960 Bering Sea-reduction fishery is from 200 to 440 million pounds. In addition to this, four freezer-ship operations are expected to produce an additional 60 million pounds. If the Japanese minimum quota alone is reached, the Bering Sea catch will represent three times the annual West Coast landings made by United States and Canadian trawl vessels.

1.953 WHALING WAS PROFITABLE--LONG AGO

Sharcott, Margaret
Western Fisheries 60, 26, 28-29, 35 (June 1960)

Whaling was an important industry in British Columbia just after the turn of the century. "Thar she blows," the traditional cry of whalers was silenced once again on the Pacific Coast when the whaling station at Coal Harbour closed this spring after 11 consecutive years of operation. Although whaling was carried out by West Coast Indians in dugout canoes before the time of the white man, whaling from shore stations in British Columbia is only about 55 years old.

The first shore station was built on Barkley Sound in 1905 and was operated until 1914. A second station was built by the same company in 1907 at Narrowgut Inlet and was operated each season until 1926. A third smaller station was built near Nanaimo to be used during the winter when the west coast stations were closed. This station closed after 3 years of operation because the number of whales passing through the Gulf had decreased so sharply that whaling on the inside was unprofitable. Place names such as Blubber Bay on Texada Island, Whaletown on Cortes Island, and Whaling Station Bay on Hornby Island appear to be connected with the activities of whaling factoryships that took their rendering pots ashore at these places.

In the early years of operation, the Pacific Whaling Company had only two whalers at its west coast stations. Each was a steam whaler built in Norway and equipped with the most modern equipment of the day including a small harpoon gun that fired harpoons tipped with explosives. The dead whales were filled with air so they would float until evening when they were towed to the stations.

These whalers worked close to shore rather than roaming far to sea as later whaling ships have done. During the early years, whaling was very good. A news report of May 1907 states that a

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 ABSTRACTER: Kathryn L. Osterhaug

2.113 MARINE CORROSION AND MARINE PAINTS

Banfield, T. A. (King's College, Newcastle, England)
Chemistry and Industry No. 21, 574 (May 21, 1960)

Although increasing amounts of light alloys and plastics are being used, ships are still mainly constructed of mild steel. The conditions of service, which are more severe than for land structures, involve exposure to widely varying climates, salt spray, or immersion in sea water. Painting is the most general method of protection, and the choice of paints is determined by the conditions of application as well as by the conditions of service. A particular feature is that marine paints must dry quickly so as to minimize the time a ship is out of service and to allow painting to proceed during periods of fine weather.

Surface preparation is the most important factor in determining the performance of paints on structural steelwork and on steel ships. The complete removal of millscale is of special importance on ships' bottoms because scale-covered areas are cathodic. Owing to the high conductivity of the environment, severe electrochemical corrosion occurs on bare areas of partially de-scaled steel. Methods of removal include natural weathering followed by scraping and wire-brushing, acid pickling, and shot- or grit-blasting. Many British shipyards now have machines for the automatic blast-cleaning of plates prior to fabrication. Temporary protectives or shop primers for application to steel immediately after blast-cleaning, are now being introduced to prevent rusting during the building period.

Corrosion of immersed steel occurs by an electrochemical process, and the primary product at cathodic areas is sodium hydroxide. Accordingly, paints for ships' bottoms must resist alkaline attack. For this reason red lead in linseed oil--the most widely used primer for structural steel--is not suitable because it is saponifiable. Paints based on alkali-resistant media such as phenolic

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 ABSTRACTER: Martin Heerdt

2.02 GLUCOSE METABOLISM IN CARP

Brown, W. Duane (Department of Food Science and Technology, University of California, Davis)
Journal of Cellular and Comparative Physiology 55, 81-85 (February 1960)

Studies were made by the author in an attempt to demonstrate the manner in which glucose is oxidized in vivo in teleost fishes. Specifically, he wished to establish whether the Embden-Meyerhof scheme or the pentose cycle is of primary importance.

Experimental procedure.--Live carp, approximately 8 inches in length, were obtained from a local supply house and maintained in the laboratory in 15-gallon tanks containing aerated tap water held at room temperature.

For each experiment, an individual carp was removed from the tank and placed in a smaller vessel for a period of approximately 24 hours prior to the start of the experiment; the fish were not fed during this period.

The metabolism chamber used consisted of a large-mouth culture flask of about 2800 ml. capacity. The flask was fitted with a rubber stopper through which were placed an inlet tube, an outlet tube, electrodes for pH determination, a thermometer, and the tip of a burette containing 1 M HCl. The outlet tube was connected through a Y joint to two suction flasks each containing 34 ml. of 1 N NaOH; these flasks served to trap the respired CO_2. They were kept under slight vacuum to insure rapid air flow through the system. The inlet tube had a fitted glass tip and introduced air that had been rid of CO_2 by passage through alkali-trapping solutions. For an experiment, the flask was nearly filled with about 2500 ml. of distilled water that previously had been acidified to pH 4 to 5 with HCl and boiled. The stopper was inserted and CO_2-free air was passed through the system for at least an hour.

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 ABSTRACTER: Kathryn L. Osterhaug

2.114 HYDRAULIC DRIVEN EQUIPMENT ON MODERN FISHING VESSELS

Anonymous
Fish Boat 5, 29-30 (June 1960)

In order to survive, the fishing industry constantly must strive for greater efficiency in vessels, gear, and fishing methods. The use of hydraulic-driven equipment can contribute to this efficiency.

The three primary hydraulic-drive systems in use by the fishing industry today are (1) the low-pressure system (3 to 600 psi), (2) the medium-pressure system (600 to 1000 psi), and (3) the high-pressure system (1500 to 3000 psi). All three of these systems have been applied successfully on modern fishing vessels.

The low-pressure system has been used widely in the Norwegian fishing fleet for driving trawl and purse-seine winches and longline gurdies. With the low-pressure system, production costs can be kept down, even when production is on a small scale, because the parts of the system do not have to be machined to close tolerance and no reduction gear is required. Installation and maintenance costs are low because high-strength piping and careful attention are not required. This system is dependable because of the simplicity of its design.

Some of the disadvantages of the low-pressure system include its low efficiency rating and the fact that the large-scale piping required does not lend itself to use with portable equipment or with the more complicated systems.

The medium-pressure system has been found to be particularly useful in the United States. One of the primary advantages of this system is the low cost of its components. The original components

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 ABSTRACTER: Kathryn L. Osterhaug

2.02 (Cross Reference: 9.13)

The fish was then injected intraperitoneally with a solution of radioactive glucose (5 μc., C-1 or C-6 labeled) in isotonic saline and quickly placed in the chamber, which was then resealed.

The respired CO_2 was swept out into the trapping solutions, which were changed at periodic time intervals. The pH was kept at 5.0 or below by the occasional addition of dilute HCl in order to insure the rapid release of CO_2 from the chamber. Preliminary tests indicated that such a procedure was satisfactory. The temperature of the water was 24° to 25°C. and did not vary more than 1° C. at any time during any of the experiments. Other preliminary studies showed that the fish could be easily maintained under these conditions, provided that distilled water was used and the pH kept at 5.0 or slightly below with HCl. Acidified tap water could not be used since the fish were affected adversely, apparently by the large amounts of acid required to maintain the proper pH; the use of buffers was similarly unsatisfactory. At the conclusion of an experiment the fish was removed from the chamber, killed by pithing, and the liver removed, packaged, and quick-frozen in an acetone-dry ice mixture.

Specific activities of various fractions of the lipids isolated from livers of the experimental fish are shown in table 1 (omitted). It would be expected that any major contribution to glucose oxidation by the pentose cycle would particularly affect the amount of C-1 of glucose entering into glycerol since this carbon atom would be lost as CO_2. Hence the fact that the specific activity of glycerol was higher in the 48-hour samples after injection of glucose-1-C^{14} than after glucose-6-C^{14} is evidence for the absence of participation of pentose cycle in glucose oxidation in these fish.

The rates of production of radioactivity in the respired CO_2 from the carp were measured. The results indicated that the oxidation of glucose in carp takes place primarily through the Embden-Meyerhof pathway with little participation in the pentose cycle. Two pentose cycle enzymes, glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase, had demonstrable, but low, activities in carp liver homogenates.

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and spare parts are readily available because their use in other industries is widespread. The size of the components and the piping makes possible numerous applications and combinations.

A disadvantage to the medium-pressure system is that great care must be taken in the installation. Manufacturers must supply users with proper instructions for operation and maintenance in order to insure success. The applications of the system are limited to drives under 50 h.p. and reduction gears are required for rotary drive.

The high-pressure system is now in use in the British trawler fleet where it is used to drive trawling winches, which require high horsepower. The small dimensions of the components in this system allow the construction of intricate combinations. The high-pressure system is very efficient and can be used for the transmission of high horsepower.

At present, the high-pressure system is relatively costly, but the cost should decrease as the system becomes more widespread. As with the medium-pressure system, great care must be taken in the installation of the high-pressure system and expensive reduction gears are required for most rotary drives.

The advantages of hydraulic drive include: (1) flexibility--any piece of equipment can be placed in the most suitable location for the proper operation of the gear it is to drive, (2) remote control--hydraulic systems allow the operation of equipment from the most convenient location, (3) centralized control--a number of different pieces of equipment can be operated from the same point, and (4) speed control--an efficient speed control in practically any range can be obtained. Controlled acceleration and deceleration of actuated parts and automatic release of pressure at overload insures that the engine driving the hydraulic pump is always protected against overload conditions.

If potential savings on fishing gear achieved through speed control and by the elimination of main engine repairs through overload control are taken into account, the hydraulic system could save an estimated $25,000 over a 5-year period in addition to the saving in manpower.

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limit of four whales a day had been imposed at each station because no more could be handled. In another report is the statement that the whalers believed there was no limit to the number of whale they could catch in a day if the stations could have handled them.

In the first years of operation, whale oil was shipped to Glasgow, Scotland, at the rate of 500 barrels a week and fertilizer or meal to Honolulu at the rate of 150 to 200 tons a month. In these first years, an 8-cent-a-gallon duty made it impractical to sell oil to the United States, but in later years the tariff must have been removed because Proctor and Gamble, soapmakers of Cincinnati, Ohio, became the leading buyers of oil, while the meal was shipped to the orange groves of California.

In addition to the usual products, oil and meal, three byproducts were marketed. One was balleen, or whalebone from the roofs of the mouths of certain whales. It was dried in the sun at the stations. The second product was whalemeat, which was canned at first for shipment to the Orient, especially Japan, and later, during World War I, 60,000 cases were canned to alleviate meat shortages at home. The third product, the rarest and most valuable, was ambergris. In 1923, 537 pounds were found in one sperm whale at Cachalot. It was a record find and as such it presented marketing difficulties. To sell it all at once would have been catastrophic to world markets, therefore, the ambergris was divided into 50-pound lots and sealed in airtight metal containers that were stored in a bank vault until it all was sold, container by container.

As late as 1941 there had been some whaling in the Queen Charlotte Islands, but is was not until 1947 that whaling along the west coast of Vancouver Island began again. The Coal Harbour station suspended operations after its 1959 season. Perhaps after a few years, market conditions will again make whaling in British Columbia waters profitable and a new page will be added to the history of Pacific Whaling.

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resins, pitches, bitumens, chlorinated rubber, or vinyl resins are generally used. On the bottoms of new naval vessels, a priming paint developed by the British Iron and Steel Research Association is used; this consists of a phenolic medium pigmented with basic lead sulphate and aluminum. The finishing paints on ships' bottoms must prevent the attachment of marine plants and animals. To achieve this they contain chemicals that are maintained in solution in a thin layer and slowly released into the sea water. This solution is poisonous to the larval settling-stages of fouling organisms. The poisons most generally incorporated in these anti-fouling compositions, as they are called, are copper and mercury compounds; whereas the binder is usually based on rosin.

A serious corrosion problem is presented by the interior of cargo tanks in oil tankers. These tanks carry oil cargoes enroute and sea-water ballast on the return trip. They usually are cleaned by jets of hot or cold sea water. In tanks used to carry refined oil products, corrosion occurs at rates that range up to 0.015 inches per year. Crude oil cargoes leave an oil or wax residue on the steel surface; this has a protective effect so long as it remains intact over the entire surface. When incomplete, it leads to localized attack by electrochemical action that may penetrate 3/16 inch in 1 year on bare areas. In recent years, a few types of paint have been developed to withstand these conditions of service and to give good protection to steelwork. The most widely used paint of this type is based on cold, catalyzed, epoxy resins.

2.114 HOW A VARIABLE PITCH PROPELLER CUT THE COST OF CLAM DREDGING

Anonymous
Fish Boat 5, 31-33, 48-49 (June 1960)

Maryland clam fishermen who operate conventional clam dredges that use two full-size gasoline engines for propulsion and power to operate the usual 6-inch centrifugal pumps have found that the low market price for clams does not allow them to operate their dredges at a profit. This is true even though there is a plentiful supply of soft-shell clams available for harvest. Fuel and maintenance for the two engines is expensive.

The problem was considered so serious by the State of Maryland that the Chesapeake Biological Station Laboratory personnel were asked to find a solution to the problem. Their orders were to modify the existing dredge to operate efficiently and economically.

In the operation of the clam dredge, the vessel is propelled forward by the main engine and the long dredge is lowered to the floor of the bay. The centrifugal pump powered by another engine forces high-pressure jets of water onto the bottom just ahead of the dredge. These jets are powerful enough to erode an 18-inch trough along the bottom, digging the clams out. The turbulence, which they create, serves to tumble the shellfish back within the mouth of the dredge. The dredge has a simple, link conveyor belt powered by a small 1-cylinder gasoline engine that hauls the clams up to the gunwale of the boat where the operator culls them and pops the catch into bushel baskets.

The reason for two power sources is the fact that the vessel can make way only as fast as the jets can erode the bottom. To run the vessel at a greater speed would only serve to raise the dredge out of it's eroded trough and thus defeat the purpose of the water jets. The propulsion engine must

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ABSTRACTER: Kathryn L. Osterhaug

2.115 TWO PACIFIC TRAWLERS DESIGNED AND TIMED TO TOMORROW'S TREND

Alverson, Dayton L. (Bureau of Commercial Fisheries, Seattle 2, Washington) and Schmidt, Peter G., Jr. (Marine Construction and Design Co., Seattle, Washington)
Pacific Fisherman 58, 29, 31-33 (June 1960)

The majority of the boats engaged in the Pacific Northwest trawl fishery are small stern haulers that have been converted from seiners, trollers, or halibut schooners. They have an operational range of about 500 miles. These trawlers are hampered by the distance they must travel, their small capacity, slow running speed, and inability to fish in rough waters.

It is suggested that future trawlers be designed to be capable (1) of efficiently exploiting grounds currently fished and (2) of trawling in the Gulf of Alaska and the Bering Sea.

The combination 84-foot seiner-trawler is a departure from current seiner-trawler designs. It has an offset deck house, stern ramp, and an offset combination trawl winch. The offset deck house provides the unique advantages of approximately 315° visibility, protection for the winch operator, a large, clear work area, and a hydraulically controlled boom or crane free to swing 300°. The stern ramp and drum winch allows the cod end to be brought aboard in two lifts.

The vessel also is easily adaptable to purse-seining or long-lining and can be used in the Alaskan king crab or shrimp fishery and has a hold capacity of 120,000 lbs. of iced fish or 129,000 lbs. of fish in chilled sea water.

A middle-distance 127-foot trawler-seiner has the same deck features and advantages as the 84-foot boat but, because of its added length, will allow the net to be brought on board in one haul.

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ABSTRACTER: Lael Ronholt

2.115 RECENT TRENDS IN FISHING VESSEL DESIGN

Anonymous
World Fishing 9, 55-56, 59 (April 1960)

The yearly catch of fish per fisherman varies throughout the world and ranges from half a ton to 80 tons, depending upon the richness of the fishing grounds and, to a great extent, the efficiency of the fishermen, boats and gear. In the Mediterranean, a fisherman catches on an average between 1 and 2 tons a year. One reason for this low figure lies in the fact that the Mediterranean Sea can be looked upon as a semi-desert, as it has very little plankton and low density of fish. The hourly catch of a typical Mediterranean trawler with a 200 h.p. motor is about 50 kg. (110 lb.). Thus 4 h.p. or roughly 0.8 kg. (1.77 lb.) of fuel is necessary to catch 1 kg. (2.2 lb.) of fish. A U. K. North Atlantic white fish trawler must catch about 700 kg. (1,550 lb.) per hour to break even, the actual catch is often greater. The output of the engine during trawling is about 700 h.p., thus only about 1 h.p. or 0.2 kg. (0.44 lb.) of fuel is needed to produce 1 kg. (2.2 lb.) of fish. Herring trawlers have a much larger catch. This explains why fish catches, and thus fish prices and the standard of living of fishermen, are so different. Increased mechanization alone cannot change this pattern in any particular fishery.

The wider use of echo sounding and echo ranging, together with the possibilities of refrigeration and the wider use of light for the attraction of fish, indicate a change from passive to active fishing--passive fishing represented by methods requiring the fish to entangle or hook itself, and active fishing by trawls and purse seines where the fish is hunted and surrounded.

The two important active fishing methods are purse seining and trawling. Purse seining is rather costly, requiring large nets to surround the fish and much manpower. It requires the fish to be in schools, whether they congregate naturally or are attracted by lamps.

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2.117 AUSTRALIAN YARD BUILDS A 62-FOOT ALL WELDED ALUMINUM FISHING BOAT; THE FIRST OF ITS KIND

Anonymous
Fish Boat 5, 19 (June 1960)

One of the largest all-welded boats ever built has been turned out by a firm in Fremantle, Australia. The new 62-foot Lady of Fatima, destined to serve the Fremantle crayfishing industry, represents a pioneer effort in the use of aluminum for large, commercial fishing vessels. That a well-equipped small yard was able to complete the vessel in less than 6 months is an indication of the rapid advances that have taken place in aluminum welding techniques during the past few years.

Constructed of high-strength, corrosion-resistant aluminum alloys, the Lady of Fatima will spare her owners the costly and time-consuming operations such as chipping, stripping, caulking, and painting that are required on steel or wooden ships.

The new vessel is economical to operate because of her light weight and high degree of cleanliness. She is easy to dock because of her reduced draft.

In the matter of building costs, the Lady of Fatima is comparable with steel or wooden vessels. She cost approximately $75,000. A 230-h.p. diesel engine propels her at an operating speed of from 9 to 10 knots.

Aluminum has often been called the metal of the future and it may be destined to play an important part in the future of the fishing industry where repairs and maintenance, which take vessels and equipment off the job, can often make the difference between profit and loss.

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ABSTRACTER: Kathryn L. Osterhaug

VARIABLE PITCH PROPELLER FOR CLAM DREDGE

FISHING VESSEL DESIGN

IMPROVED TRAWLER DESIGN

WELDED ALUMINUM VESSEL

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A purse seine is hard to haul, and many attempts have been made to mechanize the operation by winding the seine on drums, or lifting it by long booms on special turntables on the stern of the boat. The recent American development of a powered block has made it possible to reduce the necessary manpower from 16 to 8 for handling big sardine and herring nets, and it is becoming increasingly popular in the American tuna fishery.

Trawl depth determination. --Over the past 20 years, much research has been carried out to develop a mid-water trawl for fish swimming between the bottom and the surface. Such a trawl must be raised or lowered at a moment's notice, once the fish shoal has been located by the echo sounder, but so far it has been difficult to determine the depth of the trawl accurately. There have been two important developments recently. In the U.S.A., trawl wires with electrical conductors inside have been developed that continuously transmit indications to the boat from a depth recorder on the net. In Northern Europe it has been found that, by applying a second transducer for the echo sounder on the headline of the trawl, the recordings from the transducer can be transmitted, via a separate cable, to the ship's echo sounder. In this way, not only does the skipper know the height of the trawl from the bottom, but also whether fish are entering the mouth of the net. By increasing or decreasing trawling speed, the net can be raised or lowered.

It has often been said that the stern hauling of trawls from small fishing vessels can only be done under comparatively good weather conditions, and that side trawling is more a rough weather method. The two techniques require different deck arrangements. Stern hauling normally requires the engine and wheelhouse to be forward, whereas in side trawling these are aft. From the naval architectural and marine engineering point of view, it is naturally a disadvantage to have heavy weights forward, and a long propeller shaft subject to the hogging and sagging of the ship. On the other hand, the long range operation of even small fishing vessels requires a bunker capacity that is often heavier than the weight of the engine and the wheelhouse. This brings the LCB (longitudinal center of buoyancy) aft of midships, even in the outbound condition, and steel construction reduces the risk of hogging and sagging.

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Until recent years, aluminum was not considered for fishing vessels because welding techniques had not been refined. In the very recent past, cost has been a major factor in preventing more experiments with aluminum fish boats. Boats such as the Lady of Fatima clearly demonstrate that welding is no longer a difficult problem and operation of these boats may convince fishermen that savings from maintenance and operation of aluminum vessels more than make up for the additional cost. Also to be considered is the fact that additional time will be available for fishing instead of fixing.

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be idled while the engine powering the centrifugal pump turns at 1500 to 2000 r.p.m. This was the primary obstacle the Solomon Islands researchers had to overcome.

Improvement in the economy of the operation called for the removal of one engine. The engine was lifted out and the boat and pump then were powered from a single engine using a standard power takeoff from the forward end of the engine.

The problem that developed at this point was how to develop the needed r.p.m. for running the pump without pushing the vessel ahead too fast. The researchers turned to propeller design for a solution and found it in a variable pitch wheel that, when set at a very shallow pitch, barely provided enough thrust to push the boat through the water even though it was turning at the high speed required to operate the pump. Because variable pitch propellers are relatively expensive, the researchers had to find some medium within the reach of the average fisherman.

There are two types of variable pitch wheels--the continuous actuation type in which the pitch may be varied while the prop shaft is rotating and the intermittent actuation type in which the prop shaft must be stopped while the pitch is changed. Since the latter is much the less expensive, that design was chosen in this case. Working around this, a wheel of 19-inch diameter on a 5-inch hub was evolved. Pitch range was from 19 inches forward to 19 inches reverse and the wheel was designed for 110 shaft h.p. at 1400 r.p.m. The wheel was mounted on a standard taper shaft by means of an adapter.

After stopping the rotation of the prop shaft, the pitch could be changed by a small crank handle under the stern sheets of the boat. Depressing the crank handle engaged the gears at the after end of the prop hub. As the crank was turned the desired pitch was obtained. A spring mechanism raised the crank handle and shaft, disengaging the gears. The whole operation required but a few seconds.

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It also provides a sheltered deck on which the catch can be handled and processed. The capacity of the hold is 400,000 lbs. of iced fish or 430,000 lbs. in chilled sea water. The fish can be unloaded through doors on the side shelter deck or through the unloading hatch. This type of vessel also is easily converted to seining and can be used in the herring, sardine, or tuna fisheries as well as for king crab or shrimp fishing.

The smaller trawler is proposed for areas currently being exploited and for running distances of approximately 500 miles, whereas the larger boat is designed to not only fish these areas, but the distant grounds of the Gulf of Alaska as well. Because of the ability of these boats to fish in rough weather, it is believed that a 15 to 20 percent increase in catch could be shown over present vessels. Greater general efficiency in hauling and setting would be another advantage.

Processing facilities could be installed on the main deck of the larger trawler. Diesel-powered refrigeration compressors, which would permit storing the catch in low-temperature sea water, could also be installed.

2.118 IMPROVED FREEZER PERFORMANCE ON "JUNELLA"

Anonymous
World Fishing 9, 63-64, 67 (May 1960)

The first commercially successful freezing trawler was the Fairty I. Ships of this type, however, are not suited to the wishes of most British trawler owners. Because of this, the Torry Research Station has been working on the design of freezing equipment that is suited to the conditions found on orthodox trawlers. This work resulted in the Northern Wave experiment, which was very successful within the limits of the equipment that then was available.

Since the time of the Northern Wave, the workers at Torry have continued to improve freezing techniques, refrigeration manufacturers have produced more compact machinery, and trawlers have changed to diesel propulsion. All of these developments have provided extra space for the storage of frozen fish, so that it now is possible to specify a trawler of orthodox dimensions that can freeze 300 kits of fish per day and store between 4,000 and 5,000 kits of frozen fish.

In order to gain experience in freezing fish at sea, the owners of the trawler Junella had her fitted with a pilot plant capable of freezing 50 kits of fish per day and a cold store capable of holding 300 kits of frozen fish.

The Junella is a steam trawler of 170 feet, built in 1947. Because of the small scale of the pilot plant, it was decided to drive the refrigeration compressor direct from diesel engines and to use the same compressors to refrigerate both the cold store and the freezer. Each compressor is directly driven by a 17½-horsepower engine. The cold store is maintained below -20°F. by the use of pipe grids cooled by direct expansion of the refrigerant.

The vertical-plate freezers are designed to run as a natural circulation-flooded system, and the

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 ABSTRACTER: Kathryn L. Osterhaug

2.6 FISH MARKETING AND CONSUMPTION IN THE PACIFIC COAST STATES

Christensen, S. Kent and Boshell, Russell M. (Agricultural Experiment Station, Oregon State College, Corvallis)
Special Scientific Report: Fisheries No. 335, 183 pp. (December 1959) (U. S. Fish and Wildlife Service, Department of the Interior, Washington 25, D. C.)

This report is a comprehensive survey of the marketing and consumption of fresh, frozen packaged, and smoked fish and shellfish in the states of California, Oregon, and Washington. The purchasing habits and preferences of consumers for salmon, halibut, sole, rockfish, and crab in these forms were examined in detail by the authors.

The retail distribution of fresh fish and shellfish in the Pacific Coast States was examined with special emphasis on the major problems confronting the retailers. The selling practices of retailers who stock frozen packaged fish were analyzed in some detail because of the large number of retail stores involved. Only a limited analysis was made of the retail distribution of smoked fishery products.

The study of the wholesale distribution of fishery products is concerned with the type of wholesaler and type of product, the services offered to retailers, the storage facilities used by wholesalers, and their suggestions and opinions in connection with product improvement and promotion.

A series of recommendations based on this study is presented as follows:

Retailer, wholesaler education.--(1) The attitude and knowledge of retailers about fish is the key to successful merchandizing of the product. Organized educational programs should be undertaken to teach retailers the proper methods of handling fresh fish. In particular, the importance of

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 ABSTRACTER: Kathryn L. Osterhaug

2.144 UNDERWATER ELECTRIC LAMPS FOR LIGHT FISHING

Kristjonsson, H. (Fishing Gear Section, FAO Fisheries Division, Rome, Italy)
Current Affairs Bulletin No. 25, 1-2 (August 1959) (Indo-Pacific Fisheries Council, FAO, Bangkok, Thailand)

Some Italian purse seine fishermen have replaced their traditional kerosene or gas pressure lamps with underwater electric lamps. Normally two 500 W lamps are submerged approximately 3 to 4 ft. below the surface under a small boat which carries a gasoline or diesel powered electric generator set of 2 to 3 kw. Occasionally, an additional light is also used above the water. Such above-water lights give a wide horizontal spread of light, but naturally they are mainly useful when the sea surface is unruffled. 32 V generators are normally used with 24 V lamps. Thus the light intensity can be varied from yellowish light over to bright white despite the voltage drop in the rubber cables.

The intensity of the light is kept constant, although theoretically it would seem advantageous to use a light of maximum intensity and brightness during the early stages, in order to obtain maximum range for attracting fish into the area under the lamps, and then gradually dim the light somewhat to compact the school before setting the net around it.

Before sunset each purse seiner usually tows out to the fishing grounds two light boats which are anchored at a considerable distance from each other. One man is left in each boat to tend the lights and to look for signs of fish gathering below, such as air bubbles rising to the surface when the fish jettison air from their swimming bladders in order to maintain neutral buoyancy when swimming up to shallower depths. If no signs of fish are noticed after two or three hours, the light boats may be removed to another place.

From time to time the purse seine boat communicates with the light boats and when it is decided

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2.9 AN IMPORTANT AID TO NON-INTENTIONAL ADDITIVE STUDIES

Bogner, Robert L. (Nuclear Science and Engineering Corporation, Pittsburgh, Pennsylvania)
Food Processing 21, 66-67 (May 1960)

Determining the identity and quantity of indirect or incidental food additives presents a tremendous challenge to the food industry. These indirectly added materials, of unknown composition, may present a formidable problem of identification and measurement because they are usually present, if at all, in minute amounts and in complex media. They are not added directly to a food product for any functional purpose. Rather, they may be incorporated into foods as a result of processing, packaging, and storing. Included in this category are substances that might migrate or transfer from a food wrapper or container (inks, dyes, coatings, and adhesives used on packaging), chemicals which find their way into foods from the processing equipment, conveyor belts, plastic or rubber tubing, etc. They may also occur as residues in foods from meat-, milk-, and egg-producing animals treated with veterinary medications or receiving feed supplements as part of their diets. Furthermore, indirect additives may also become part of the final food product from certain agricultural chemicals such as weed killers and pesticides.

The problem then, is to find out what migrates in order to know if its safety has already been established. Second, it is important to know how much migrates. Often a substance is considered safe if found in foods at a low enough level, but harmful if it exceeds certain limits. Of course, there is the possibility that there is no migration at all, in which case the problem is eliminated entirely.

Conventional analytical techniques may fail to detect residues, reaction or conversion products and metabolites that must be considered in a comprehensive investigation of the use and fate of such additives.

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 ABSTRACTER: Kathryn L. Osterhaug

FREEZING AT SEA IN BRITAIN

ELECTRIC LAMPS FOR LIGHT FISHING

MARKETING FISH

FOOD ADDITIVES STUDY

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to make a set, the man in the light boat ties its anchor rope to a float with a small lantern and drifts or rows very slowly a short distance away in order to enable the purse seiner to set the net around the school without interference from the anchor rope. As soon as the net has been shot and pursing begins, the light boat is rowed slowly towards and across the centerpiece of the corkline in order to induce the fish to swim away from the opening of the net under the purse seiner. The light boat remains just outside the net until pursing is completed, when it returns to the anchor buoy or transfers to another likelier fishing spot.

Although some underwater lamps are available as a standard commercial commodity, most of the Italian fishermen have their lamps made in local workshops. First step, obtain the electric bulb; then find a strong rubber hose, such as automobile radiator hose which fits closely over the neck of the bulb. An ordinary socket can be used with the bulb as it is dry and well protected by the rubber hose which fits at the upper end closely over a brass cylinder through which is drilled a central hole for the rubber cable. To prevent water from entering along the cable, ordinary tallow packing or a conical rubber packing can be used. Several coats of shellac should be applied where the rubber hose meets the bulb and the brass cylinder. A small reflector above the bulb will improve the illuminating efficiency and a heavy weight must be attached below the bulb to keep the lamp vertical.

Compared with above-the-surface lights, the main advantages of underwater lamps are: better utilization of the light as there is no loss caused by reflection from the sea surface and a less powerful light is needed (when underwater lamps were adopted by sardine boats in a Tunisian fishing village after a demonstration by an FAO expert the savings in fuel were estimated at about Fr. 1,000,000 per night); the underwater light is steady, whereas the above-the-surface lamp gives a flickering uneven light, especially when the surface is ruffled. With underwater lamps the fishermen are able to attract fish effectively in rougher weather, and less time is lost during the full moon period. Better penetration is achieved in turbid water and fishing can be resumed earlier after rains and storms.

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Radiotracer techniques. -- Very often these additives must be detected in the sensitive range of parts per million or parts per billion. In this case, radioisotope tracer techniques often provide the only, and certainly the most rapid, economical and valid way of testing. Radiotracers are isotopically labeled materials. The radio-label can be detected in minute amounts regardless of where the material goes and irrespective of what happens to the material. Thus, use of tracers permits measurements with extreme sensitivity and specificity.

Results of radiotracer tests will be most valid when the product under test is identical to the commercial product with the exception that a portion of the usual stable, nonradioactive content of a compound is replaced by an equal weight of the tagged compound. Fulfilling this production or processing necessity requires that the radio-compound (ink, stabilizer, adhesive, tape) of interest, must be incorporated into the production process at the same time and in the same fashion as is customary for the inactive material. Because of costs and possible contamination considerations, incorporation is not always feasible by the customary methods. Therefore, a research, pilot-scale or laboratory modification must be utilized. The addition of radiotracers to standard fermentation tanks, paper manufacturing machines, batch mixers, and actual food processing lines has, however, been possible.

Residue and reaction-product experiments. -- In the case of a radioisotope-labeled solvent in residue and reaction-product experiments, a scaled down laboratory technique must be developed and employed for the food exposure tests unless the particular radiosotope preparation can be introduced in actual processing phases.

There are several specific examples of the successful utilization of radioisotope tracers in determining the presence of incidental additives in final food products. Among these have been studies of wax linings in milk containers and lubricants for metal containers, determination of residues of ethylene oxide and methyl bromide as fumigants and metabolic fate and residues of ethoxyquin used in animal feeds as an antioxidant.

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liquid level is maintained by means of a frost pipe level control and expansion valves. This method avoids the use of expensive special pumps for circulating the refrigerant.

In order to conserve space, the designers of the pilot plant designed special freezers that discharge from one end so that no working space is required beneath them. The freezers also are novel in that release of the frozen fish is accomplished by virtue of the properties of a thin plastic film on the surface of the freezer plates. Use of plastic in this way means that a hot gas-defrosting system is not required.

During the first trip of the Junella the freezers were in practically continuous operation until the cold store was completely full. No difficulty in unloading was experienced during this period. The freezing plant worked very well during the trip, and the cold store temperature was maintained without difficulty.

The first trip happened to be particularly suitable for trying out the freezing system because the weather was bad enough to interfere with early fishing and to provide a severe test of the freezing system. The vessel was tied up for a total of 90 hours in the early part of the trip so that all suitable fish from the first part of the trip were frozen. The Junella landed after 23 days with a catch that was significantly higher in quality than would ordinarily be expected from a voyage of this duration.

The author feels that the time is now ripe for the appearance of economically justifiable, freezing trawlers of about 200 feet. Such ships may render the present British trawler fleet obsolete. It is unlikely that any of the steam trawlers could successfully convert to freezing, but some of the more modern diesel and diesel-electric ships could probably be so converted.

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icing fish on display should be stressed even where modern refrigeration cabinets are used. The icing of fish is by far the most satisfactory method yet found for keeping fresh fish from deteriorating rapidly, and at the same time providing an attractive retail display device. (2) Retailers and wholesalers should be educated about proper storage temperatures for frozen packaged fish and about the maximum storage life for each species of frozen fish. A large proportion of the trade was found to be uninformed on these matters.

Service improvement. --(1) Wholesalers should take the lead in developing a satisfactory display case for fresh fish; that is, one in which ice can be used properly. In terms of the demand for floor space, technical information on how a portion of the meat case might be remodeled to permit adequate and attractive icing may have greater acceptance with retailers than a separate fish case. (2) More frequent delivery of fresh fish to retail stores should be considered. The one-day-a-week delivery, which the majority of the stores now receive, results in either poor quality fish part of the week or in no fresh fish being available much of the time. (3) The practice of delivering frozen, packaged fish to retailers in trucks with no refrigeration should be discouraged.

Product improvement. --(1) The development of Federal grade standards should be encouraged for both fresh and frozen packaged fish. (2) Wholesalers should encourage the development of more satisfactory packaging material for prepackaged fresh fish. Many additional stores, mainly supermarkets, would handle fresh fish if this were to be done. (3) Greater stress should be placed on fish quality. Better in-plant methods for determining quality of fresh fish should be established; more rigid sanitary regulations should be enforced; and fishermen should be taught the importance of proper handling, including the proper icing of fish.

Consumer education. --(1) Considerably more advertising, promotional, and educational work should be done by the trade. This is particularly important in the light of the tremendous influx of consumers from inland areas who are not accustomed to eating fish. Specific attention should be focused on the southern California market where per capita fish consumption is extremely low. (2) Wholesalers should undertake educational programs to encourage consumers to cook fish by methods other than frying. One of the important consumer complaints about fish is objectionable cooking odors. Such odors occur mainly with fried fish, especially if the quality of the fish has deteriorated.

3.12 PROCESSING AND QUALITY STUDIES OF SHRIMP HELD IN REFRIGERATED SEA WATER AND ICE PART 3 - HOLDING VARIABLES AND KEEPING QUALITY OF THE RAW WHOLE SHRIMP

Seagran, Harry; Collins, Jeff; and Iverson, John
Commercial Fisheries Review 22, 1-5 (May 1960)

This report is the third in a series resulting from an investigation of the use of refrigerated sea water for holding Alaska shrimp. The work reported here was designed to determine the effect of temperature, brine concentration, and shrimp-to-brine ratio on the keeping quality of raw whole shrimp. Similar shrimp held in ice were used as controls.

Experimental.--The shrimp were held in refrigerated sea water at different temperatures, brine concentrations, and shrimp-to-brine ratios as well as in ice. At intervals during storage, samples of shrimp were removed and examined objectively in order to evaluate quality changes that had taken place.

Analyses were carried out as previously described (Collins, Seagran, and Iverson 1960) for total solids, total chloride, total nitrogen, nonprotein nitrogen, amino nitrogen, total volatile acid, and trimethylamine. The limit of acceptability of the ice-held and refrigerated sea-water-held shrimp was obtained subjectively by smelling the cold, drained, whole shrimp.

Results.--The following observations were made during the experiments:

1. For all holding methods, the shrimp meats showed a progressive decrease in contained solids with increased holding time. Total solids content appeared to decrease at a greater rate with higher temperature, with lower brine concentration, and with lower shrimp-to-brine ratio.

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 ABSTRACTER: Kathryn L. Osterhaug

3.19 PRODUCTION AND PREVENTION OF IRRADIATED ODOR IN BEEF

Hedin, P. A.; Kurtz, G. W.; and Koch, Robert B. (Quartermaster Food and Container Institute for the Armed Forces, Chicago 9, Illinois)
Food Research 25, 382-388 (May-June 1960)

Introduction.--Over the past several years the Quartermaster Corps has been trying to determine whether radiation can supplement or replace refrigeration as a means of food preservation. With beef, the dose necessary for sterilization is responsible for what has been widely characterized as an "irradiated" or "wet dog" odor. Until recently, there has been no general agreement regarding the component or components in beef from which the odor arises. Similarly, there is no agreement regarding the nature of the components responsible for the odor.

Purpose.--This study was made to determine (1) the component or components of beef from which the irradiated odor arises, (2) the chemical nature of the odor, and (3) a means of preventing its evolution. To approach the problem, the authors decided to fractionate an aqueous extract that was obtained by refluxing the beef previous to irradiation. Characterization of the implicated fraction also was planned.

Irradiation processes.--Irradiation was performed in the gamma facility at Argonne National Laboratory, Lemont, Illinois. Samples both as a 33-percent slurry and in the dry state were sealed in evacuated metal cans and given a dose of 5 megarads. Samples were kept frozen at all times, except during exposure in the facility.

Preparation of fractions from beef.--Twelve hundred grams of defatted beef chuck was diced and refluxed overnight with 1200 ml. of a 10-percent saline solution. The resulting saline extract

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 ABSTRACTER: Martin Heerdt

3.19 THE PRESERVATION OF FISH WITH IONIZING RADIATION: BACTERIAL STUDIES

MacLean, Donald P. and Welander, Camille (Food, Chemical and Research Laboratories, Inc., Seattle 5, Washington)
Food Technology 14, 251-254 (May 1960)

Introduction.--Numerous investigators have shown that gamma radiation is effective in destroying most food spoilage organisms, but chemical alterations of the food also occurs, which affects its organoleptic acceptability. The extent of both bacterial destruction and alteration is dependent on the amount of radiation used and varies with the organisms involved and the character of the food product.

The present study was undertaken to determine the effects of ionizing radiation at various levels on the bacterial flora of fillets of Pacific cod (Gadus macrocephalus) during storage in melting ice (0°C.). The principal objectives were (1) to compare bacterial counts of unirradiated and irradiated fillets, (2) to identify bacterial genera present before and after irradiation and during storage, (3) to estimate relative numbers of bacteria generically at various levels of irradiation and intervals of storage, and (4) to assess the food-poisoning potential of the micrococci that are present.

Experimental.--Fillets for these experiments were prepared from fresh cod by normal commercial production procedures. Fillets were washed with cold water, drained, cut into $2\frac{1}{2}$-inch circles, packed in No. $\frac{1}{2}$ flat C-enameled cans, and sealed without vacuum. Levels of radiation used in experiments 1, 2, and 3 were, respectively, 0 (control), 0.07, 0.14, 0.23, and 0.46 megarad; 0 (control) and 0.2 megarad; and 0 (control), 0.5, 1.0, and 2.0 megarads.

At each sampling, 33 grams of fillet, in approximately equal proportion from the two or three

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 ABSTRACTER: Martin Heerdt

3.2 OUR EXPERIENCE IN INTRODUCING COMPLEX MECHANIZATION

Orishich, K. P. (Chief Engineer of the Liepaya Fishing Combine, U.S.S.R.)
Translator: Gidon Raphael
Rybnoe Khoziaistvo (Moskva) 34, (7) 43-49

The Liepaya district is one of the richest fishing districts on the Baltic. Cod is fished throughout the year. During the spring and summer seasons, daily delivery at the local fishing combine reaches 150 to 300 tons, and on some days up to 500 tons.

Until 1956, it was very difficult to process this amount of fish because modern mechanical equipment was almost completely lacking and no production line existed to join the various operations. The means for an uninterrupted flow of work was not available.

The author developed plans for mechanizing the unloading, transporting, and primary processing of the fish. He also prepared a plan for mechanizing the canning procedure.

The fish now are unloaded by seven cranes and are carried to the sorting department by means of belt conveyors. After being sorted, the fish are carried to a four-way gutting conveyor where all primary processing is carried out.

The refuse is disposed of through pipes to an open hydro-conveyor and collected in a tank of 1.5 m^3 capacity. From there it is pumped through an underground sewer of 200-mm. diameter asbestos-cement pipes to the oil and meal plant, which is located at a distance of 200 meters. Wooden boxes that weigh from 25 to 30 percent of the weight of their net contents no longer are used as receptacles inside the plant.

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 ABSTRACTER: Kathryn L. Osterhaug

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was filtered, concentrated to 250 ml. under reduced pressure, and dialyzed, first against 10-percent saline solution and then against water for several days and with periodic changes of the water. The dialyzable fraction was concentrated and lyophilized. The undialyzed fraction also was lyophilized. From 1200 grams of meat, 35 grams of nonvolatile solids were obtained. Approximately two-thirds of the solids were nondialyzable.

Chemical analyses of the nondialyzable fraction.--Protein nitrogen was determined by the Kjeldahl method; amino nitrogen was determined by the Frame method. Phosphorus was determined gravimetrically as $Mg_2P_2O_7$ according to the A. O. A. C. official methods of analysis. For quantitative amino acid analysis, a 5 mg. moisture-free sample was hydrolyzed with 6 N HCl at 105° for 48 hr. in a sealed tube. The hydrolyzates were adjusted to pH 2.2, applied to a Dowex 50-x-5 ion-exchange column, and chromatographed according to the procedure of Moore and Stein.

Electrophoretic studies.--The electrophoretic pattern of the sample before and after irradiation was obtained in veronal buffer at pH 8.7 and at an ionic strength of 0.1.

Results.--The irradiation odor of beef arose chiefly from a water soluble, nondialyzable fraction. This fraction is a mixture of at least two electrophoretically separable proteins. It appears that the odor is associated with sulfhydryl or closely related compounds since cysteine and methionine could no longer be detected in the protein after irradiation. In addition, the odor is quenched by sulfhydryl reagents. The protein was found to contain small amounts of iron and phosphorus. The irradiated odor was not released until water was added to the protein irradiated in the dry state. Evidence is presented to show that only a finite amount of odor can be produced from the water-soluble protein fraction. Paper chromatographic studies demonstrated that reagents such as 1-anthraquinonesulfonic acid, silver nitrate-bromphenol blue, 1-fluoro-2, 4-dinitrobenzene, 3, 5-dinitrobenzoyl chloride, and platinum iodide-formed derivatives with compounds present in the irradiated protein but not in the original sample.

3.2 (Cross Reference: 1.0145, 3.33)

Operations within the refrigerating plant were reorganized. Instead of being delivered in boxes for distribution on freezing shelves, now the washed fish are delivered to the packing table on a mesh belt from which the water can trickle off. The packing table is equipped with two roller conveyors that take the fish that have been placed in grids into the freezers by means of shelved trolleys.

Particular attention was paid to mechanizing the canning, can producing, and storage departments. In the selection of machines, emphasis is placed on improved construction, reduced weight, improved precision, and improved appearance.

Two double-deck conveyors, one for the oil and the other for the tomato line, were installed in the can-filling department. The upper decks carry filled cans and the lower decks carry empty cans. To avoid denting the empty cans, fenders made of 0.5-meter rubber strips are fastened along the sides of the lower decks. The sealed cans slide through a chute to the showers where they are rinsed with hot water before being loaded into autoclave baskets. For more complete utilization of their capacity, the baskets are fitted with brackets so that cans can be heaped above the rim of the baskets.

Before the plant was modernized, the sterilized cans were packed in boxes and individually were polished with sawdust and rags. At present, the washing and drying is performed by speed machines with an output of 24,000 cans per shift. The machine is provided with a cable conveyor that carries the cans successfully through two washing zones, one with an alkali solution and the other with hot water, and then on to the dryer.

From the washing and drying machine the cans are placed on the two outer bands of a four-way conveyor that divides the store room into two equal parts. The cans move along the conveyor lying on their rims. At 1-meter intervals there are lap doors on the side barriers of the conveyor that open inward. By opening a flap, it is possible to dump a can into a directing junction, and from there to deliver it by chute to its place in a stacked column.

3.12

2. Nonprotein nitrogen formed slowly, presumably by enzyme hydrolysis. Free amino acids appeared to be preferentially utilized for bacterial growth. The protective effects of lower temperature and higher salt concentration were observed in this latter respect.

3. The salt content (as NaCl) of the meats attained at equilibrium in the 6-percent and 3-percent brines was approximately 3 percent and 1.8 percent, respectively.

4. The maximum storage life of fresh whole shrimp in ice appeared to be approximately $8\frac{1}{2}$ days. The minimum storage life of fresh whole shrimp in 3-percent refrigerated sea water at 30°F., in 3-percent refrigerated sea water at 32°F., and in 6-percent refrigerated sea water at 30°F. appeared to be at least $5\frac{1}{2}$, $3\frac{1}{2}$, and $6\frac{1}{2}$ days, respectively. It appeared that either lowering the temperature from 32° to 30°F. or increasing the brine concentration from 3 percent to 6 percent sodium chloride gave an effective increase of storage life of from 1 to 2 days, other conditions being kept constant.

5. Spoilage products contained in raw shrimp in excess of approximately 1 milligram of trimethylamine nitrogen per 100 grams of wet meat and in excess of 0.1 milliequivalent of volatile acid per 100 grams of wet meat indicated a product of limited subsequent storage life.

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pieces in each can, was cut with sterile scissors and transferred to a sterile stainless-steel or aluminum Waring Blendor jar. Then 297 ml. of sterile water was added, and the sample was blended for 2 minutes. Dilutions were made in blanks of sterile 0.1 percent peptone. Plating was done by using duplicate plates of tryptone-glucose-yeast extract agar, according to Anderson et al. (1956).

Results with experiment I.--Pseudomonas and Achromobacter, the genera closely associated with terminal malodorous spoilage of fish appear to have been virtually eliminated at comparatively low levels of gamma irradiation. The predominant genera of the controls were Flavobacterium, Micrococcus, Pseudomonas, and Achromobacter with a smaller number of Corynebacterium. Also in order of predominance, genera of irradiated samples were Micrococcus, Pseudomonas, Sarcina, and Corynebacterium with a minor group composed of Bacillus, yeast (Torulopsis), and Mycoplana.

Results with experiment II.--In this study, 138 cultures from the controls and 183 cultures from the samples irradiated at 0.2 megarad and representing all colony types were identified. Pigmented Pseudomonas was not found in this experiment. In irradiated samples, Achromobacter, while at one time comprising 23.8 percent of the total population, subsequently, was overgrown by Micrococcus and Corynebacterium.

Results with experiment III.--After exposure to irradiation levels of 0.5, 1.0, and 2.0 megarads, 171 isolates of micro-organisms revealed the presence, in order of probable predominance, of the following: Micrococcus, Corynebacterium, Sarcina, Alcaligenes, Flavobacterium, Achromobacter, Bacillus, Pseudomonas, Bacterium, Mycoplana, Actinomyces, Lactobacillus, Protaminobacter, and Streptococcus.

Results with micrococci.--Of 61 cultures of Micrococcus tested for coagulase, three were slow positive in Difco desiccated coagulase plasma, all were negative in fresh human plasma, and none showed alpha hemolysin production. From these results it would appear that the micrococci found were probably not "enterotoxin" producing organisms and are not a probable source of the commonly called "staphylococcal" food poisoning even though the genus Micrococcus predominates.

3.2495 CHANGES IN THE ADENOSINETRIPHOSPHATASE ACTIVITY AND SULPHYDRYL GROUPS OF COD FLESH DURING FROZEN STORAGE

Connell, J. J. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 11, 245-249 (May 1960)

Introduction.--Even when desiccation is prevented, the texture of certain types of fish, particularly cod, is subject to toughening and the loss of gelatinousness during frozen storage. These changes are markedly dependent upon the temperature of storage. They usually are attributed to the denaturation of the structural proteins of the fish flesh (Love and Ironside 1958). Denaturation has been inferred from the fact that progressively less actomyosin, a structural protein complex, can be extracted from the flesh as the time in storage increases. This progressive denaturation often parallels an increase in toughness that is evident if the fish is cooked and chewed.

Because the insolubility of actomyosin is not an altogether satisfactory criterion of denaturation, Partmann (1954) investigated enzymic deactivation in frozen fish and beef during storage. Since myosin, the main structural muscle protein, will split adenosine triphosphate (ATP), Partmann hoped to evaluate denaturation by measuring the ATP-ase activity of muscle during storage. He found that the enzyme activity of frozen tench muscle remained unchanged during the first 3 months of storage at -18°C., a condition which normally would be expected to produce considerable insolubility of the protein. The authors decided to perform similar though more extensive experiments. These experiments are described in this paper.

Materials.--Cod that were about 24 inches in length and that had been kept for no more than 2 or 3 days in ice were filleted, and the fillets were frozen in an air-blast freezer so that the center of each fillet reached -5°C. or below in about 30 minutes.

The frozen fillets were wrapped in aluminum foil to prevent desiccation and stored at -14°, -22°,

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 ABSTRACTER: Martin Heerdt

3.332 MACHINE FOR GUTTING SMALL FISH

Chivilenko, V. P. and Vedernikov, I. I. (Kaspniro Laboratory of Mechanization)
Rybnoe Khoziaistvo 34, 62-64 (1958) (Moscow)
Translation published for the National Science Foundation and the Department of the Interior, Washington, D. C. by the Israel Program for Scientific Translations PST Cat. No. 68, OTS 60-21096

On the basis of research work carried out by the authors of this article, an experimental model of a machine for gutting small fish has been constructed that makes possible the mechanization of this operation to a considerable degree. The machine removes the fish heads and tail-fins as well as the entrails, and eliminates preliminary sorting into sizes. The arrangement for removing the entrails is based on the use of vacuum.

The work of the machine proceeds in the following manner: the fish are placed sideways on the crawlers of the bucket with the heads directed towards the flexible mold-board. During the simultaneous movement of the elevator and conveyor, the fish move under action of the crawlers and the template along the bucket until they reach the line of the gill covers. The flexible mold-board, as mentioned before, serves as an obstruction against displacement. The head of the fish, kept from bending and displacement by the clutch band and the conveyor for supporting the heads, is cut off at the disc cutter and is lead out from the machine by a chute. The entrails are drawn out by means of vacuum through the suction cap and collected in the container, which can periodically be cleaned from a trap in the bottom. The vacuum container is connected by a tube to the air pump, which creates the required vacuum in the system.

After the entrails have been removed, the fish are loosened from the clutch band and drawn by the crawlers to the opposite side beyond the buckets. The cutters, fixed at a certain distance from

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ATP-ASE ACTIVITY OF FROZEN COD

MECHANICAL GUTTING OF FISH

4.29 ACIDOLYSIS OF VEGETABLE AND MARINE OILS WITH PHTHALIC ACIDS

Carleton, E. F. (California Research Corporation, Richmond)
Journal of the American Oil Chemists' Society 37, 366-371 (July 1960)

Introduction.--The conversion of vegetable and marine oils to partial esters by alcoholysis with polyhydric alcohols is a process that is used extensively in the manufacture of oil-modified alkyd resins. Acidolysis is a term that describes a similar alkyd manufacturing process in which oil is heated with a dibasic acid at high temperature to obtain an exchange reaction and liberation of monobasic acids from the oil. Both processes have the same purpose, that is, to change the neutral triglyceride oils into compounds that can be esterified with the other alkyd components to form an homogeneous oil-modified alkyd resin. It is the purpose of this paper to present some data (1) on the reaction of triglyceride oils with the isomeric phthalic acids and (2) on the conversion of acid acidolysis products to alkyd resins. Orthophthalic acid dehydrates to the anhydride when it is heated, but the other two isomers, isophthalic and terephthalic acids, are heat-stable. They react readily with oils at elevated temperatures.

Findings.--Three phthalic acid isomers were used in an interchange reaction with triglyceride oils at high temperatures. Orthophthalic acid dehydrated to the anhydride before an interchange occurred, whereas isophthalic and terephthalic acids were heat-stable and reacted easily with oils in the temperature range of 260° to 300°C. Isophthalic acid reacted more rapidly than terephthalic acid, and it was ideal for use in acidolysis processes of alkyd-resin manufacture. Various methods of application of the acidolysis reaction to isophthalic alkyd resin preparation were studied, and minimum oil conversion to monobasic acids that is required for successful alkyd preparation was found. Under certain conditions the acidolysis reaction occurred simultaneously with esterification, and this fact was used to improve the process. Commercial use of the acidolysis reaction in alkyd-resin manufacture is economically attractive because it is a noncatalytic reaction that eliminates the

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 ABSTRACTER: Martin Heerdt

4.29 GLYCEROLYSIS OF MARINE OILS AND THE PREPARATION OF ACETYLATED MONOGLYCERIDES

Gruger, Edward H., Jr.; Malins, Donald C.; and Gauglitz, Erich J., Jr. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Journal of the American Oil Chemists' Society 37, 214-217 (May 1960)

Introduction.--The α-monoglycerides and acetylated monoglycerides from vegetable oils and from terrestrial animal oils are used as lubricating oil additives, oil-modified alkyd resins, emulsifiers, and chemical intermediates for the synthesis of detergents and of epoxy type of plasticizers.

Relatively inexpensive α-monoglycerides and acetylated monoglycerides may be produced from the oils of marine animals. Furthermore, the fatty acid constituents of marine oils generally have longer chain lengths and a higher degree of unsaturation than do fatty acids not of marine origin. This distinction is maintained when derivatives are formed from marine oils, therefore, these compounds might be expected to have certain chemical and physical properties different from such compounds produced from other sources. Accordingly, marine-oil α-monoglycerides and acetylated monoglycerides merit investigation.

Purpose.--The objectives of the work reported in the present paper are as follows: (a) the determination of the optimum reaction time for the glycerolysis of marine oils in the production of α-monoglycerides, (b) the development of a laboratory method for producing acetylated α-monoglycerides, and (c) the investigation of the application of thin-layer silicic acid chromatography to the analysis of acetoglycerides.

α-Monoglycerides.--Although the production of α-monoglycerides from oils of nonmarine origin

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 ABSTRACTER: Martin Heerdt

ACIDOLYSIS OF MARINE OILS

GLYCEROLYSIS OF MARINE OILS

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the buckets and moving through horizontal slots, cut away the tail fins. The height of the slot permits the processing of fish of different sizes and also permits the correct adjustment of the tail fins to the line of the cut.

At the end of the elevator, the gutted fish fall down into a receptacle under their own weight and are forwarded from there to further treatment. During all these processes the fish surface, as well as the belly of the fish, are thoroughly rinsed with water.

Technical description of a tested model machine

Output	120 to 180 fish per minute
Required power	2 kw.
Dimensions:	
Length	230.0 cm.
Width	51.5 cm.
Height	130.0 cm.

Figure 2.--Position of fish in the different stages of gutting

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and -29°C. for various periods of time. At the end of each storage period, six to eight fillets were thawed overnight in a room at 4°C.; and muscle from myotomes 8 to 16 was dissected free of connective tissue in the manner described by Love and Ironside (1958), chopped with scissors, and mixed well. For the determination of enzyme activity and sulphydryl content, 1-g. samples of chopped muscle were macerated with 25 ml. of water at 0°C. in a Potter-Elvehjem homogenizer and held at 0°C.

Methods.--ATP-ase activity was determined essentially by the method of Perry (1955) for the measurement of myosin ATP-ase. The amount of phosphate that is liberated from the ATP when each macerate is incubated at 25°C. for exactly 10 minutes with ATP at pH 9.1 furnishes a measure of the enzyme activity of the macerate.

The method used for the determination of sulphydryl groups in macerates was based on a simple titration of 5-ml. aliquots with 10^{-3} M-p-chloromercuribenzoate at 0°C., using as an end-point the disappearance of the pink color produced by free sulphydryl groups and nitroprusside. For the determination of total sulphydryl groups, solid urea was added to aliquots of the macerate to bring the final concentration to 6 M. Nonprotein sulphydryl groups in cod muscle are only a few percent of the protein sulphydryl, therefore, they have been neglected in these experiments. Solubility of the protein was determined as described by Love and Ironside (1958) by using 5 percent sodium chloride solution at 0°C.

Results.--At -29°C. no change in enzyme activity could be detected, but at -22°C. and -14°C. a definite loss of activity occurred. The rate of loss of activity at -22°C. and -14°C. was very much less than the rate of development either of the insolubility of the enzyme, or of toughness of the flesh. No change in either easily reactable or total sulphydryl groups was detected at any storage temperature.

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had been studied rather extensively, the question still remained as to whether a satisfactory yield could be obtained from marine oils. Optimum reaction time, in the present work, was considered as the time required to produce the highest yield of α-monoglycerides with the minimum destruction of double bonds. The study of the optimum reaction time for glycerolysis of marine oils and the method for preparing α-monoglycerides is described.

Menhaden, tuna, herring, and sardine oils were used since these are the principal marine oils of commerce. In addition, oil from the eggs of pink salmon was included because the amount of unsaturation in this oil is unusually high and the oil can be produced in commercial quantities if a suitable market develops. Data characterizing the particular lots of the various oils used in this study are given.

Of the five oils studied, the optimum reaction time varied from 45 to 60 minutes depending on the kind of oil used. These results were reproducible. The relationship of the iodine value and percentage of α-monoglycerides is reported as a function of reaction time for menhaden oil.

Extension of the reaction time beyond the optimal reaction time resulted in a loss of unsaturation, as reflected by a lowering of the iodine value and a destruction of α-monoglycerides. Although the change in α-monoglyceride content was small, the loss of ethylenic bonds was substantial.

Acetylated α-monoglycerides.--A mild acetylation reaction was used. This reaction gave quantitative yields and only a slight loss of unsaturation. In the purification of the product it was anticipated that acetoglycerides would be amenable to molecular distillation, consequently this approach was investigated. Crude glycerolysis mixtures from herring, menhaden, and pink-salmon-egg oils were chosen for this investigation because of the wide range of iodine values that existed in the raw oils.

Analysis of acetoglycerides.--The composition of the distilled acetoglycerides was determined by chromatographing them on a very thin layer of silicic acid on glass plates.

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removal of catalyst residues by pressure filtration. Another advantage is that glycerol can be pumped into hot acidolysis-reaction mixtures without opening the kettle. This eliminates the disagreeable and toxic fumes that escape from hot kettles when they are opened after alcoholysis for the addition of solid phthalic anhydride or isophthalic acid.

Fish oil polymerization and fatty acid separation.--Fatty acids are one of the products of the interchange of a triglyceride oil and isophthalic or terephthalic acid. The following experiment was set up to remove some of the saturated fatty acids from fish oil during acidolysis and oil-bodying. Alkali-refined menhaden oil (1,760 g.) was heated with isophthalic acid (166 g.) at 300°C., and the lower boiling fatty acids were removed by distillation. A high rate of nitrogen sparge was used to assist in the removal of the fatty acids. After 4 hours of heating, 235 g. of fatty acid, which had acid numbers in the range of 217 to 207, were collected. After an additional 3 hours of heating, 160 g. of fatty acid were collected. At this stage the oil in the kettle had an acid number of 20, a viscosity of 3 poises, a Gardner color of 12 when diluted with 50 percent by weight of mineral spirits, and good drying properties. This process may be used to upgrade semidrying oils by removing the saturated and somewhat unsaturated fatty acids.

4.80 CHEMICAL DERIVATIVES OF FATS FOR INDUSTRIAL UTILIZATION

Ault, Waldo C.
Chemistry and Industry No. 18, 476-479 (April 30, 1960)

This paper was read before a meeting of the Oil and Fats Group of the Liverpool Section of the Society of Chemical Industry at Liverpool, on October 8, 1959.

It is concerned with (1) the utilization research program of the U. S. Department of Agriculture, (2) the types of research that have been carried out, and (3) some of the accomplishments that have resulted from research with respect to fats and oils.

Early work of the United States Department of Agriculture was directed toward a study of methods for measuring and increasing stability in bulk fats. Results lead to a method of improving the shelf life of home-rendered lard. The United States Department of Agriculture researchers have synthesized long-chain alkyl gallates, reported on their activity as antioxidants, and contributed toward an understanding of the mechanism of antioxidant action and the role of synergists. Studies also have been made on the composition and molecular structure of the glycerides of lard and tallow. These studies have played a part in the increased use of edible fats in the manufacture of shortenings. Present efforts of the research group assigned to edible fats are largely directed toward the development of improved analytical tools for use in fat analysis.

United States Department of Agriculture research on inedible fats began with work on the chemical modifications needed to produce oleochemicals. Fatty-acid structures in animal fats frequently offer advantages and seldom pose serious disadvantages in such fields as plastics, rubber, synthetic fibers, surface-active agents, plasticizers, lubricants, and waxes.

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 ABSTRACTER: Edward H. Gruger, Jr.

4.91 ESSENTIAL FATTY ACIDS PROPERTIES OF TUNA, HERRING AND MENHADEN OILS

Privett, O. S.; Pusch, F. J.; Holman, R. T.; and Lundberg, W. O. (The Hormel Institute, University of Minnesota, Austin)
Journal of Nutrition 71, 66-69 (May 1960)

Introduction.--The nutritional studies of Privett et al. (1959) demonstrated that the dermal symptoms of an essential fatty acid (EFA) deficiency in rats were not relieved by the polyunsaturated fatty acids of tuna oil. Nevertheless, menhaden, herring, and whale oils were estimated to contain 4.4, 7.9, and 6.4 percent of essential fatty acids, respectively, by a rat bioassay method based on growth under conditions of restricted water intake (Thomasson 1953).

In the present study, observations were made of the effects of tuna, menhaden, and herring oils on the dermal syndrome of an EFA deficiency in rats as a prelude to the isolation and characterization of the fatty acids responsible for the EFA activity of these oils.

Experiment 1.--Fifty male weanling rats of the Sprague-Dawley strain were maintained ad libitum on a basal fat-free diet (Privett et al. 1959) for 16 weeks. At the end of this period, the growth rate of the rats had reached a plateau, and all rats exhibited distinct dermal symptoms of EFA deficiency. The rats were then divided into five equal groups. Group 1 was continued on the basal, fat-free diet and used as a control group. Groups 2, 3, 4, and 5 received the basal diet in which 10 percent by weight of menhaden, tuna, herring, and corn oils, respectively, were substituted for sucrose. The corn oil-group was used as the positive control for the experiment. The rats were weighed and scored for dermal symptoms of EFA deficiency each week for an additional 12 weeks.

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 ABSTRACTER: Martin Heerdt

4.91 USE OF FISH OIL FRACTIONS IN REDUCING ELEVATED BLOOD-CHOLESTEROL LEVELS

Culbertson, Steele (National Fisheries Institute)
Feedstuffs 32, 66 (May 14, 1960)

Introduction.--According to Dr. James Peifer, recent findings on the efficacy of fish oils in reducing elevated blood-cholesterol levels have impelled a basic reconsideration of the possible contributions of these residual oils to the over-all nutritive value of formulated animal feeds.

Many recent reports have indicated beneficial physiological effects attendant upon reductions of elevated blood-cholesterol by adjustment of dietary fat intake. The key point of the reports has been the desirability of attaining a better balance of saturated and unsaturated fatty acids in the diet of the American consumer. The fatty acid of choice, to date, has been linoleic acid, which is present in relatively large quantities in corn and safflower oils. The effective principle in linoleic acid appears to be related to its two points of unsaturation.

Findings.--More current reports have indicated that the efficiency of a fatty acid in reducing blood-cholesterol levels is a direct function of its degree of unsaturation rather than of its essential (vitamin-like) fatty acid activity. Inasmuch as fish oils form a rich source of extremely unsaturated fatty acids, these oils were investigated as possible depressant agents. Research studies indicated that both the fish oils and the individual fish-oil fatty acids were considerably more effective in reducing blood-cholesterol levels than was linoleic acid. Fish oil triglycerides produced an almost immediate depression of blood-cholesterol upon administration, whereas linoleic acid required approximately 2 weeks before producing an observable and significant depression of blood cholesterol. Finally, the research demonstrated conclusively that there is some form of direct relationship between the degree of unsaturation (iodine value) and the degree of cholesterol reduction. The more

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 ABSTRACTER: Martin Heerdt

4.92 EFFECTS OF DIET ON FISH OIL TOXICITY IN THE RAT

Ershoff, Benjamin H. (Western Biological Laboratories, Culver City, California)
Journal of Nutrition 71, 45-53 (May 1960)

Introduction.--The prolonged administration of fish oils will induce or accentuate symptoms of vitamin E-deficiency in a number of animal species. Symptoms of vitamin E-deficiency such as muscular dystrophy in herbivora or encephalomalacia in chicks can readily be alleviated by the concurrent feeding of α-tocopherol (Dam et al. 1938; Mackenzie and McCollum 1940). They can also be alleviated by various nontocopherol supplements. Jukes and Babcock (1938) described a paralytic disorder in chicks that could be prevented either by feeding a fat-soluble fraction prepared from soybean oil, presumably vitamin E, or by feeding a water-soluble fraction prepared from fat-extracted alfalfa meal.

More recently Dam et al. (1948 and 1951) observed that a number of apparently unrelated compounds including methylene blue, ascorbic acid, and nordihydroguaiaretic acid had significant activity in preventing encephalomalacia in chicks on diets containing cod-liver oil. Similar findings were obtained by Singsen et al. (1955b) with N, N'-diphenyl-p-phenylenediamine (DPPD) and by Bunnel et al. (1955) with other antioxidants including 2, 6-ditertiary butyl-4-methoxyphenol; dibutyl and diamyl hydroquinones; di-sec-butyl-p-phenylenediamine; and 1, 2-dihydro-2, 2, 4-trimethyl-6-ethoxyquinoline (Santoquin). Methylene blue, ascorbic acid, and tetraethylthiuram disulfide (antabuse) were also active in protecting against the development of such symptoms of vitamin E-deficiency as fat coloration and peroxidation, incisor depigmentation, hepatic damage, and sterility in rats fed diets containing cod-liver oil (Dam et al. 1949). Methylene blue was also active in preventing dystrophy in calves that were fed a diet containing cod-liver oil (Blaxter et al. 1953). Scott (1951a) observed that the addition of fish-liver oil to the diet of poults resulted in a

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 ABSTRACTER: Martin Heerdt

FAT DERIVATIVES FOR INDUSTRY

FISH OIL FATTY ACIDS

REDUCING BLOOD CHOLESTEROL

FISH OIL TOXICITY

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Experiment 2. -- The second experiment was conducted in two parts. In the first part, 50 male weanling rats were divided into five equal groups each of which received the basal, fat-free diet, ad libitum. Groups 1, 2, and 3 received orally, and in addition, 200 mg. per day of the ethyl esters of menhaden, tuna, and herring oil, respectively. Group 4 received orally, and in addition, 200 mg. per day of ethyl linoleate. Group 5 received no supplement and was used as the negative control for this experiment. The animals were scored for dermal symptoms of EFA deficiency and weighed each week of the experiment for 14 weeks.

Part two of the second experiment followed immediately after part one and the same groups of rats were used. Group 1, 2, and 3 received the basal fat-free diet except that 10 percent by weight of the ethyl esters of menhaden, tuna, and herring oil had been substituted for sucrose. Group 4 received the basal fat-free diet except that 10 percent by weight of corn oil had been substituted for sucrose. Group 5 received the basal, fat-free diet only. Feeding, scoring, and weighing as in part one was continued for an additional 14 weeks.

Results. --The dermal scores obtained in experiment 1, at the end of the 16th and the 28th week, indicate that all of the fish oils cured the dermal symptoms of EFA deficiency and stimulated growth equally as well as corn oil. The growth rate of the EFA-deficient animals was stimulated by feeding 10 percent of fish oil.

In the first part of experiment 2, in which 200 mg. of the fish-oil esters were administered daily, the dermal symptoms of fatty acid deficiency developed equally as fast and as severely in the rats that received the fish-oil esters as in the rats that received the fat-free diet. In contrast, the growth rates of rats that received the fish-oil esters compared favorably with the growth rates of the rats that received ethyl linoleate and they were significantly greater than those of the rats that received the fat-free diet. When the amounts of these oils were increased to 10 percent in the diet in the second part of experiment 2, the dermal symptoms of EFA deficiency were cured. The cure occurred earliest in the animals that received the corn oil. Corn oil was followed in the order of decreasing effectiveness by tuna, menhaden, and herring oils.

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high incidence of enlarged hock disorder and that high levels of α-tocopherol acetate (50 mg. per lb. of diet) failed to prevent the disorder.

Purpose. --Further data are presented to indicate that toxic effects other than an induced state of vitamin E-deficiency may result from feeding fish oils.

Findings. --Immature rats fed a purified low-fat diet supplemented with 10 percent of crude or refined tuna oil, crude sardine oil, crude menhaden oil, or cod-liver oil showed a highly significant retardation in growth, which was accompanied by diarrhea. These effects were largely counteracted by the concurrent administration of cottonseed oil at a 10-percent level in the diet. Soybean oil, sesame oil, corn oil, and wheat-germ oil at a 10-percent level of feeding were also active in this regard; but olive oil, coconut oil, hydrogenated cottonseed oil, butter fat, and lard when fed at a 10-percent level in the diet had little if any protective effect. α-tocopherol when administered at levels of 0.025, 0.05, or 0.1 percent in the diet had a significant protective effect. This protective effect, however, was not as great as that obtained with (1) DPPD; (2) Santoquin; or (3) sesamol, a methylene ether of oxyhydroquinone and a constituent of sesame oil, all of which were fed at 0.05-percent levels in the diet. In addition to the materials indicated above, alfalfa meal at a 20-percent level in the diet; desiccated liver N. F. and Torula yeast at a 10-percent level of feeding; supplements of casein, fish meal, or a mixture of crystalline amino acids at a 10-percent level in the diet; and DL-methionine at a 0.6-percent level of feeding also had significant activity in preventing growth retardation and diarrhea in immature rats that were fed a purified low-fat diet supplemented with 10 percent of crude tuna oil.

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Experience indicates that if the fatty acids are to be used as chemical intermediates, it will be advantageous to have them available in commercially pure forms.

Investigations have progressed in the areas of fractionation and purification of fat-derived products such as oleic acid. Chemical modifications of unsaturated fatty acids have been under study with respect to producing oxygenated products such as epoxides, hydroxyl derivatives, certain phosphorus and sulfur derivatives, and various products of carboxyl group reactions. Most important of the group has been the development of vinyl esters and vinyl ethers.

Conclusions. --The production of both edible and inedible animal fats in the United States has increased substantially during the past decade, whereas the usual outlets have dwindled. Edible animal fats are finding an increased outlet as shortenings. Most of our research program, however, is directed toward (1) the preparation of fat derivatives and (2) their evaluation for use in industrial fields in which their unique chemical structure offers advantages. In this way markets in such diversified areas as plasticizers, plastics, surface-active agents, and waxes are being found.

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unsaturated the fatty acid fraction, the more efficient was the fatty acid in its functions.

Most fish oils contain 20 to 30 percent saturated fatty acids and 70 to 80 percent unsaturated fatty acids. Corn oil by comparison, contains 15 percent saturated and 85 percent unsaturated fatty acids. Fish oils are outstanding because of the large proportion of highly unsaturated fatty acids that they contain. About one-half of the 70 to 80 percent of the unsaturated fatty acids of fish oils contain three, four, five or six double bonds; whereas the unsaturated fatty acids in corn oil contain only one or two double bonds. Usually 20 percent or more of the total fatty acids in a fish oil have five or six double bonds.

Since it is the total unsaturation that governs the cholesterol depressant effect of an oil, the fish oils have a much higher potential action in this respect than do the vegetable oils.

Conclusions. --The long-chain, extremely unsaturated fatty acids derived from fish oil appear to offer a most effective means of adjusting cholesterol levels in the blood with a minimum of adjustment in caloric intake. Several proposed special diets are based on the ingestion of 1 ounce of corn oil two to three times daily as compared with the relatively great preparative effort of replacing ordinary foods that contain saturated fatty acids with foods that contain unsaturated fatty acids. Fish oil fatty acids may be more effective than corn oil in these special diets.

6.132 PRODUCTION OF QUALITY FISH MEAL KEEPS NEW BEDFORD PLANT BUSY

Anonymous
Maine Coast Fisherman 14, 10-11 (June 1960)

A new kind of fish meal is being manufactured in New Bedford, Massachusetts. The meal, which is made by a solvent extraction method, is stable and contains no fish oil. Sixteen tons of meal is manufactured daily at the New Bedford plant.

At present, some of the meal is being sold to manufacturers of animal and poultry feeds, who pay a premium price for the product compared to the price of conventional fish meal.

Fish flour made from this same meal is being fed to children in hospitals in Mexico, El Salvador, Pakistan, Brazil, Ecuador, and Peru.

The New Bedford company, which is the only one that manufactures fish meal at low temperatures, began operating at peak capacity during 1959, after more than 2 years of trials and study to perfect the process.

The fish are unloaded from the fishing boats either by being pumped out of the hold or by being hoisted out in baskets, dumped onto a moving conveyor, and emptied into a trailer for transport to the meal plant. Fillet plant gurry is trucked in large metal drums to the riverside plant.

First step in the meal-manufacturing process is taken in the "raw box" at the plant. It is in this area where the fish are unloaded from the trucks that fish frames and industrial fish are pitched

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 ABSTRACTER: Kathryn L. Osterhaug

6.14 MULTIWALL PAPER CONTAINERS

Dowling, Thomas E. (Packaging Section, American Cyanamid Co., New York)
Chemical Engineering 67, 116, 118, 120 (May 30, 1960)

In this article, we will tell you how to select the proper bag for your purposes. Let us select a hypothetical product, endow it with certain characteristics and qualities, and design a bag to fit it.

Suppose, then, that we have a dry, free-flowing, granular product that has a bulk density of about 60 lb. per cu. ft. and is moderately hygroscopic. We plan to produce about 60 to 70 million pounds per year with about half of the product going to overseas markets and about half to domestic markets. We intend to sell it as a chemical intermediate in large quantities for about 30 cents a pound. There is no hazard associated with its handling or use.

Choice.--A dry, free-flowing granular product, which is one of the simplest forms of material to pack in bags, permits a wide choice in types of filling equipment and types of bags. We are interested in a filling speed of about 10 bags per minute. Since our product does not contain a significant quantity of fines and is relatively inexpensive, we will specify a valve-type bag and thereby eliminate the sewing and tape-closing operations. A taped and sewn closure is generally considered stronger and more dependable than a pasted closure. For the more rigorous export service we would prefer a sewn bag; however, a pasted bag should be good enough for domestic shipments.

Weight and size.--In our hypothetical case, we have a fairly dense commodity; and we generally make large volume, palletized shipments. We would therefore elect to offer 100-pound units to the domestic as well as to the export trade.

Proper dimensions.--For our product (density 60 lb. per cu.ft.) we should consider a bag with

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 ABSTRACTER: Martin Heerdt

6.190 PROTEIN QUALITY

Halloran, Hobe
Western Feed and Seed 15, 32 (May 1960)

Simple chemical methods of evaluation of protein quality usually give inconclusive results, whereas protein digestibility and microscopic examination when used together will provide a satisfactory method of evaluation. The chemical method of evaluation that was developed by Dr. H. J. Almquist in 1935 provides an index of protein quality that gives a close approximation of actual biological values. Feeding a protein concentrate to chicks or poults, however, yields the most accurate information on biological availability.

Rand and coworkers recently reported on the biological examination of fish meals and found widely varying results in growth response. Whole fish meal and meal made from fish muscle were approximately the same; however, meal made from scales and skins and meal made from fish bones had low biological, protein quality. The same workers also found that the removal of fat from high-quality fish meals lowered the average protein quality of the defatted meals, whereas the removal of fat from very poor meals increased the average protein quality of these meals. These defatted meals retained their original protein quality values even after 12 months of storage; however, four of the seven meals that contained fat decreased significantly in protein quality during storage. Rand and coworkers hypothecated that the fish oil was at least partly associated with these changes since the extracted oil was found to be rancid. They concluded that a good-quality meal that contains oil may become a poor meal by the time it is fed.

Some producers of menhaden meal add antioxidants during the manufacture of the meal. This has resulted in an apparent increase in the biological availability of protein. These meals possibly

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 ABSTRACTER: Martin Heerdt

6.192 MARYLAND BROILER TRIAL

Combs, G. F. and Nicholson, J. L. (University of Maryland)
Feedstuffs 32, 18, 20 (May 21, 1960)

Introduction.--Broiler trial S-29 was concerned with the effect of ambient temperature, vitamin additions, and various animal protein supplements to simplified, practical broiler rations. Vantress X Arbor Acre cross-bred broilers of both sexes were used throughout. Duplicate pens of 150 males each and duplicate pens of 150 females each were reared separately on each of the rations indicated below. The study was so arranged that one of each duplicate pen was represented in each half of a broiler house. After the chicks reached 5 weeks of age, (1) they were changed to and maintained on finishing rations and (2) one-half of the house was regulated at an ambient temperature of approximately 63°F. 3 feet from the floor, whereas the other half of the house was regulated at an ambient temperature of approximately 53°F. In this way, the effect of the 10°F. ambient temperature differential was studied during the 5th to 8th week. All of the chicks were kept in the original broiler house, which had been used for all previous substation trials.

Procedure.--In several previous trials, small but consistent increases in body weight have been obtained from the addition of certain animal protein supplements to otherwise simplified, practical broiler rations. In this trial, 2½ and 5 percent menhaden fish meal, 2½ percent condensed fish solubles, 2½ percent condensed fish solubles plus 5 percent menhaden fish meal, 5 percent crab meal, and 5 percent poultry byproducts meal were used as supplements in broiler rations. Rations containing no animal protein supplements with and without certain additional vitamins also were fed. Finishing rations were based on modified starting rations.

The levels of fat and methionine were varied by the addition of different animal protein supplements in order to maintain the same calculated energy, protein, and methionine levels.

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 ABSTRACTER: Martin Heerdt

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a tube width of about 21 inches and a tube length of 32 to 34 inches. Tube width is generally split between the face and gusset dimensions in any reasonable manner such as 16x5, 17x4, or 18x3 inches. Face width is the distance across the bag from side fold to side fold; gusset width is the depth from front to back.

Palletizing requirements generally dictate the division of dimensions, but optimum bag proportions generally have a length of one and one-half to two times the face width. For the sewn valve bag, we suggest as a starter a face width of 17 inches, a gusset width of 4 inches, and a length of 34 inches. Similarly for the pasted bag, we might begin at 22 inches by 4 inches by 32 inches.

Valve size not critical.--The advantages of a greater filling speed, which might result from a larger valve opening, may be offset by the greater chance of sifting or accidental contamination. Therefore, we will compromise and select a 4-inch valve opening.

Sidewall construction.--We can make a rough estimate and suggest for domestic use a construction of 2 plies of 50-lb. kraft paper plus 2 plies of 60-lb. kraft paper as a starting point, with the 60-lb. kraft on the outside. For the export bag, which should be stronger than the domestic bag, we suggest that a moisture barrier be added to protect against the uncertain weather conditions often encountered in this service. A 90-lb. asphalt laminated barrier consisting of 1 ply of 30-lb. kraft paper, 1 ply of 30-lb. asphalt, and 1 ply of 30-lb. kraft paper per ream of 500 sheets size 24 inches by 36 inches should be adequate. We suggest, then, the following construction for our export bag: 2 plies of 50-lb. kraft paper, 1 ply of 60-lb. kraft paper, 1 multiple ply of 90-lb. asphalt laminated barrier, and 1 ply of 70-lb. kraft paper. At least 50 bags should be tested in this manner. Even after using bags for long periods, minor changes in size and construction may be required.

Conclusion.--To avoid the possibility of error when purchasing bags, you should write a specification for each different bag purchased.

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onto a conveyor belt that carries them to the cooker. After that, the mixture moves through a vacuum system of grinders, cookers, and desolventizers before coming out as finished meal.

The meal is moved by conveyor to a storage tank. From there it goes through a hammer mill for further pulverization and then is weighed out into 100-lb. bags. It takes just 7½ minutes to turn a fish into a finished meal.

Facts established as a result of the operation of the New Bedford plant show: (1) cost of processing is no more than conventional processing. All the protein of the fish is conserved and all the oil is extracted. (2) An additional 2 percent of oil is produced. A 100-ton plant will give an increased yield of 4,000 lb. of oil per day over the conventional process. (The oil is used in tanning leather and paint manufacture.) (3) Meal is stable because it is defatted. It can be stored indefinitely without fear of deterioration. (4) The processed fish meal, being defatted does not contribute fishy tastes to eggs, pork products, or milk.

The process involves temperatures of 80°C. or lower. There is no water pollution. Distilled water, another byproduct of the process, is piped back into the Acushnet River. No residue of any kind is left over for disposal. The fish flour is made from meal shipped to the parent firm in Illinois. Additional processing of the fish meal made in the New Bedford plant produces a neutral-tasting fish flour.

Mexican studies on the use of this flour show it to be the solution to the tragic protein starvation disease--a problem that appeared without solution until this new process of making low-cost fish flour was developed.

Studies in El Salvador show the flour to be valuable as a protein supplement in bread, as a protein extender in school lunches, and in foods for restaurants, hospitals, and miltary establishments.

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Metabolizable energy values were used as a basis for these modifications. Changes in the limestone and dicalcium phosphate levels also were made in order to keep the calcium and phosphorus levels constant.

Results.--No responses were obtained in this trial from the addition of any of the animal protein supplements including menhaden fish meal, condensed fish solubles, crab meal, poultry byproducts meal, or certain combinations of these supplements. Nor were responses obtained from the addition of ascorbic acid, pyridoxine, biotin, and folic acid. Although no responses were obtained from the addition of animal protein or "fish factor" supplements, this trial must be considered as only one of several.

The results of other trials involving additions of pyridoxine, biotin, folacin, and ascorbic acid to simplified corn-soybean meal-type broiler rations also were summarized. Although some numerical differences might be considered hopeful, the data cannot be interpreted as meaning that any of these vitamins are critical when they are included in corn-soybean meal-type practical broiler rations, and the rations are fed to broiler chicks that are maintained under floor pen conditions with the specific drugs used in these trials.

During the 5th to 8th week, the broilers that were in the house maintained at 53°F. actually gained slightly more weight numerically, without an increase in the feed required per unit of gain. Although the difference probably is not meaningful, a temperature of 53°F. did not appear to have an adverse effect on performance.

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have better storage characteristics and present less of a problem in feeding. The addition of antioxidants during manufacture undoubtedly will improve the quality of high-fat protein concentrates.

Several years ago University of California investigators under Dr. C. R. Grau and Dr. Howard Kratzer developed a 10-day feeding test that gives a relative evaluation of different protein concentrates. Abnormal differences show up since each protein concentrate is used as the sole source of the protein. Grau and Kratzer have used this method extensively in evaluating fish meals, meat meals, and the addition of supplementary amino acids. At least one feed company is using it for evaluating its sources of protein concentrates. Some typical results obtained recently at the Halloran Research Farm are as follows:

Evaluation of protein with brooder chicks

	Growth per day Percent
Broiler ration	8.0
Protein concentrate No. 1	3.1
Protein concentrate No. 2	5.7
Protein concentrate No. 2, heated	2.6
Heated protein concentrate No. 2 with sulfur amino acid added	3.7

This type of evaluation of protein concentrates is of value (1) to ingredient manufacturers for evaluating processing problems and (2) to feed manufacturers for determining the best sources of protein concentrates.

6.195 AMINO ACID REQUIREMENTS FOR PROTEIN-DEPLETED CHICKS

Anonymous
Nutrition Reviews 18, 149-150 (May 1960)

Introduction.--The concept that there is a fixed quantitative requirement of the dietary essentials has been challenged.

Experiment 1.--H. Fisher, P. Griminger, and G. A. Leveille studied this problem in chickens under conditions of protein depletion (J. Nutrition 69, 117 [1959]). They fed a basal diet containing 22 percent of protein to day-old male chicks for 2 weeks, after which time half of the chicks were given a diet free of nitrogen for an additional week, whereas the other half were fed the basal diet. Next, the chicks were grouped according to weight and were fed graded levels of either methionine or lysine, which are critical amino acids. Thus 10 lots of 10 chicks each, received 5 different amounts of each amino acid in basal diets containing 20 percent protein.

Results.--Chicks that had been previously depleted of protein, derived added benefits from each increment of either amino acid. Meanwhile, the normal chicks demonstrated a plateau in rate of growth at the second level of amino acid supplement.

Experiment 2.--In an attempt to interpret these findings, the authors designed a further study in which normal chicks were fed diets containing amounts of protein successively smaller than the 20 percent given in the original studies. This was done to test the chicks' ability to utilize methionine or lysine only to the extent of their optimal protein needs. By contrast, the depleted birds, which required all of the protein supplied in the 20 percent diet, might utilize these limiting amino acids to full advantage.

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ABSTRACTER: Martin Heerdt

6.195 IMPROVEMENT OF PROTEIN VALUE FOR HUMAN NUTRITION

Wrenshall, C. L.
Food Technology 14, 4, 6-7, 10, 12, 14, 16, 18 (April 1960)

Protein malnutrition varies from frank deficiency through debilitating insufficiency to suboptimal intake. There may well be many persons with a suboptimal intake even in well-nourished countries like the United States--especially groups under nutritional stress as in growth, pregnancy, lactation, convalescence, or disease.

One way of providing more protein value to those who need it is to improve the protein quality of some of the poorer proteins they are now eating. An elegant scientific way to do this is to improve their patterns of essential amino acids by adding the limiting amino acid.

Lysine is the limiting amino acid of a number of important foods and in many individual diets. There are four special reasons why lysine is a critical amino acid in human diets.

1. Lysine is absolutely indispensable because the body cannot make it at all.
2. A significant amount of the lysine in foods is nutritionally unavailable.
3. Lysine is lost in food processing and refining.
4. Lysine is readily destroyed or inactivated by cooking.

Arguments objecting to lysine supplementation have been discussed, including mutual supplementation, reasoning from average values, minimum daily requirements, and amino acid imbalance.

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Author's summary

6.195 RECENT STUDIES WITH LAYING HENS. PART 1 - AMINO ACID REQUIREMENT

Fisher, Hans (Rutgers University, New Brunswick, New Jersey)
Feed Bag (Red Book) pp. 9, 11 (1960)

Introduction.--Many proteins are not deficient in amino acids, therefore, in studies based on the amino acid requirements of laying hens, the author formulated synthetic rations that were composed entirely of crystalline amino acids as the source of nitrogen to keep hens in production.

Experiment 1.--Part 1 of this study was based on a practical evaluation of the quantitative requirement of each of the amino acids in a systematic fashion in place of the infinite series of experiments that would be required if each of 11 amino acids were evaluated. An assumption was therefore made that the requirements for egg production should bear considerable resemblance to the pattern of amino acids as found in whole egg protein, the ultimate end point of the dietary amino acids. Amino acid ratios were established on this basis by choosing lysine as equal to one and using it as the base for all ratio calculations.

Next the lysine requirement of the hen was determined directly, and this requirement was then related to the requirement for all of the other amino acids by multiplying it with the ratio that was established from the pattern present in whole egg protein. When the amino acid levels established by the this so-called ratio technique were fed to hens, they supported average egg production. This average was further improved by a 10-percent increase in all of the amino acids. These requirements have been tentatively termed minimal requirements for egg production with the full understanding that they do not represent the requirement for optimum production as will be explained shortly.

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ABSTRACTER: Martin Heerdt

6.52 NATURE AND CAUSE OF THE "COTTON-FUR" ABNORMALITY IN MINK

Stout, F. M.; Oldfield, J. E.; and Adair, John (Oregon State College, Corvallis)
Journal of Nutrition 70, 421-426 (April 1960)

Introduction.--A condition known as cotton fur in which the underfur of affected mink develops a drab, white color and a flimsy texture, with the longer guard hairs normally colored, was described by Seton (1929). Occurrence of this condition causes considerable economic loss. During 1940 to 1943, studies at Pullman, Washington, indicated that no cotton-fur mink were obtained from matings of cotton-fur parents or interbreeding of their descendants when a standard mink ration was fed (Hummon and Bushnell 1943). According to Helgebostad and Ender (1955) symptoms characteristic of cotton fur occurred when mink were fed diets primarily composed of coal fish (Gadus virens). The cotton-fur condition appeared to be intensified by the presence of large amounts of marine fats in the feed. These findings led Helgebostad and Ender to conclude that fat peroxides acted in vivo to destroy certain B vitamins necessary for normal fur pigmentation.

In the United States, cotton-fur mink have often been associated commercially with the feeding of whiting (Merluccius bilinearis). In Oregon, an unexpectedly large proportion of cotton-fur mink resulted when attempts were made to use Pacific hake (Merluccius productus) for mink feed (Adair 1955).

Data presented in this paper indicate that mink with cotton fur are the product of a genetic-nutritional interaction in which susceptible mink families succumb to an unidentified heat-labile factor present in Pacific hake and whiting. Also presented are observations on the nature of the fur abnormality, means of prevention, and effects of inclusion of various qualities and quantities of fats on the production of cotton fur in mink.

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ABSTRACTER: Martin Heerdt

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Experiment 2. -- The amino acid values obtained by the ratio method could be in error if the two components which make up this requirement, namely (a) the maintenance requirement of the hen and (b) the requirement for the egg, do not remain in the same relationship to each other. To achieve a mixture of amino acids that will provide optimum production, egg size, and body weight, the author next began an investigation of the amino acid maintenance requirement of the chicken.

The maintenance studies showed a very high requirement for arginine and a negligible requirement for lysine. A maintenance requirement could not be established at all for histidine, whereas this amino acid was definitely essential for the production of eggs.

The availability of these maintenance requirement figures now permitted a prediction of the requirements for egg production. These requirements were based on the sum of the maintenance values plus the amino acids found in the proteins of the egg. These values, which have been computed on the basis of a daily requirement, are tabulated below and compared with the previously established minimal requirements.

Daily amino acid requirement for egg production expressed as milligrams per 1.5 kilogram hen

Amino acid	By ratio	By maintenance[1]	Amino acid	By ratio	By maintenance[1]
	mg.	mg.		mg.	mg.
Cystine	153	191	Phenylalanine	391	376
Methionine	221	259	Tyrosine	280	?
Histidine	170	139	Threonine	360	500
Isoleucine	468	508	Tryptophan	110	123
Leucine	638	733	Valine	502	520
Lysine	468	443	Arginine	680	581

[1]Maintenance requirement plus amino acids in egg protein.

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Experimental. --More than 1,000 mink were fed experimentally over a 5-year period with a basal diet of the following percentage composition: horsemeat, 7; beef liver, 4; tripe, 14; mixed sole, 42; mixed rockfish, 25; wheat germ, 2; commercial mink cereal, 2; brewers' yeast, 1.5; alfalfa meal, 1.5; and steamed bone meal, 1. Whole fishes were ground and included in the basal diet. Experimental diets were prepared by replacing varying amounts of the basal fishes (generally sole) with similar weights of hake or whiting.

Results. --The inclusion of either hake or whiting in the ration consistently yielded mink with cotton fur, and this condition appeared to be directly dependent on the percentage of hake or whiting included in the diet of the mink. When the fish were cleaned and the viscera discarded the incidence of cotton-fur mink was lowered.

The external appearance of mink with cotton fur varies with the individual animals. Quite often mink so affected are small and emaciated and have a roughened fur coat along with the characteristic light-colored underfur. Some mink with cotton fur, however, appear to be in a healthy condition. The lack of pigment in the underfur is the most striking symptom of a large syndrome that characterizes mink with cotton fur. This amount of underfur depigmentation is not typical of all mink with cotton fur, as an array of animals from those possessing an underfur almost devoid of pigment to those approaching a normal fur color have been observed. In many cases the depigmented underfur covers only the sides of the mink. If the hake were thoroughly cooked before they were mixed into the ration the development of cotton-fur could be eliminated completely. The inclusion of 5 percent of animal or marine fats in the ration under conditions conducive to fat peroxide formation did not yield cotton-fur pelts.

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Accordingly, groups of protein-depleted chicks received 16 to 24 percent protein, whereas the normal or control chicks received diets containing 14 to 22 percent protein. One-half of the chicks in the control group also received the optimal quantity of lysine, a limiting amino acid, at the rate of 5 percent of the protein level; whereas one-half of the protein-depleted chicks also received lysine at the rate of 6 percent of the protein level.

According to the authors hypothesis, normal chicks fed a diet containing somewhat less than 20 percent protein, but including lysine as 5 percent of the protein in their diet should gain weight as well as other normal chicks fed a higher level of protein. By contrast, the depleted birds should show a smaller response if fed less than 20 percent of protein even though lysine is present as 6 percent of the protein in their diet.

Results. --The results confirmed the validity of this hypothesis in both groups of birds. The normal birds required no more than 16 percent protein when given lysine at the rate of 5 percent of the protein level, and the depleted birds required 20 percent protein when given lysine at the rate of 6 percent of the protein level. Furthermore, their growth could be accelerated by increments of protein, provided the lysine-to-protein ratio remained constant at 6 percent.

Conclusions. --These results indicate that chicks depleted of protein require larger quantities of methionine and of lysine than do normal chicks, but this need is merely a reflection of their greater requirement for protein. In each instance, the amino acid requirement could be shown to represent a fixed percent of the total protein requirement.

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Lysine supplementation of appropriate foods is proposed as a step toward optimal nutrition.

Forty-six references are cited.

7.80 CHEMICAL INDICES OF DECOMPOSITION IN OCEAN PERCH

Hillig, Fred; Shelton, L. R., Jr.; Loughrey, J. H.; and Fitzgerald, Beatrice F. (Food and Drug Administration, Washington 25, D. C.)
Journal of the Association of Official Agricultural Chemists 43, 433-438 (May 1960)

Introduction.--In a previous communication, Hillig et al. (1958) reported a study of the chemical indices of decomposition in cod. A brief summary was given in that paper of the work that has been in progress in the Food and Drug Administration for several years on development of chemical methods to detect decomposition in fishery products. Reference was also made to some of the work of other investigators. The progressive deteriorative changes that take place in fish when they decompose were described and evaluated. The preparation of authentic packs of cod, haddock, and ocean perch was described. Reference was made to the previously published chemical methods that were used in analysis of the packs, as well as to a description of the procedures used for determining volatile amines and volatile bases.

In a later paper, Hillig et al. (1959) reported on chemical indices of decomposition in haddock and referred to his paper on cod for a description of the preparation of the packs and the methods of analysis.

From a study of the data submitted in those two papers, Hillig concluded that the volatile acid number, formic and acetic acids, volatile bases, volatile amines, and trimethylamine show a high degree of correlation with organoleptic judgment, whereas succinic acid and alcohol show less correlation.

Under preparation of packs, the paper on cod stated that authentic packs of ocean perch were prepared during the summer of 1957. During the summer of 1959 an additional authentic pack of

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 ABSTRACTER: Martin Heerdt

8.51 NITROGEN EXTRACTIVE SUBSTANCES OF FISH MUSCLE

Severin, S. E. and Vul'fson, P. L. (Department of Animal Biochemistry, M. V. Lomonosov State University, Moscow)
Biochemistry (U.S.S.R.) 24, 923-929 (November-December 1959)

The nitrogenous extractives in the muscle tissue of fish varies with species, habitat, and living conditions. It is known that fractions of the nitrogen extractives constitute 9 to 18 percent of the total nitrogen in the muscles of bony fish and from 33 to 38 percent in the muscles of cartilaginous fish. Cartilaginous fish contain large amounts of urea, trimethylamine oxide, and betaine. The muscular tissue of many cartilaginous fish contain the dipeptides carnosine and anserine. In the muscular tissue of all of the species of fish studied are found creatine, creatinine, and creatine phosphate. Reports have been made of large amounts of histidine in tuna muscle. In skates the presence of betaine and sarcosine is characteristic, and for cod muscle, anserine and methylhistidine are characteristic. Taurine has been isolated from cod muscle.

The purpose of the work reported in this paper was to make a quantitative determination of the nitrogen extractives of various fish and to attempt to establish whether or not there is any regularity in the development of these compounds depending on the functional characteristics of the muscle connected with the type of life and the species of fish.

The fish studied could be divided into several groups. The first group was a cartilaginous flat fish, the spiny skate. In skate muscle, in addition to β-alanine there is sarcosine. The content of amino nitrogen in skate muscle is very high. The authors did not analyze for such compounds as urea, trimethylamine oxide, and betaine, which are known to be present in the muscles of cartilaginous fish.

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 ABSTRACTER: Kathryn L. Osterhaug

8.51 COMPOSITION AND AMINO-ACID CONTENT OF HIGH-GRADE WHALE MEAT MEAL

Pritchard, H. and Smith, Patricia A. (Birkenhead, Cheshire, England)
Journal of the Science of Food and Agriculture 11, 249-252 (May 1960)

Introduction.--During the last few years, white fish meal, meat meal, and whalemeat meal have been examined in this laboratory for general composition and content of the vitamin-B complex. Recently, the amino-acid composition of meat and bone meal was determined. The results indicated that no standard series of values could be assumed for the amino-acid make up of any one product, as this varied with the type of raw material selected and the method of processing. With this information at hand, the authors decided to undertake a full study of the essential amino-acid composition of high-grade whalemeat. The influence of time lapse between the killing of the whale and the processing of the carcass was examined at the same time.

Samples of whalemeat meal.--Large samples of meal were collected, bulked, mixed, averaged, and sent to the laboratory for further sampling. A total of seven laboratory samples of meal were obtained. These meals were designated as follows: (1) floating factory-S, H., (2) floating factory-B, (3) floating factory-short post-mortem time, (4) floating factory-medium post-mortem time, (5) floating factory-long post-mortem, (6) land station-S. Georgia, and (7) land station-S. Georgia.

Assays and results.--The methods of analysis and the microbiological assay adopted were similar to those used earlier by Pritchard and Smith (1957) for whalemeat and bone meals. Whalemeat meals were found to be (1) slightly acid in nature, (2) slightly variable in ash and oil content, and (3) slightly variable in protein content depending upon the oil and ash content. Whale oil was found to vary in free fatty acid content, which was dependent upon the length of time that elapsed between

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 ABSTRACTER: Martin Heerdt

9.4 NEW TECHNOLOGICAL LABORATORY FOR FISHERIES RESEARCH IN GLOUCESTER, MASSACHUSETTS

Anonymous
Commercial Fisheries Review 22, 11-13 (April 1960)

The United States Bureau of Commercial Fisheries opened a new Technological Laboratory in Gloucester, Massachusetts, during the latter part of 1959. The purpose of the laboratory is to meet the needs of the New England fishing industry and to form a center for the long-range technological investigations of our marine resources.

The entire laboratory program is oriented toward providing the knowledge necessary for industry to attain its goal of producing fishery products of a quality as close to that of the freshly-caught fish as is possible. To accomplish this, the technological research program is divided into three major work areas dealing with: (1) the development of standards and specifications for fishery products, (2) preservation and engineering studies both on the vessel and ashore, and (3) chemical studies on the composition of fish and fishery byproducts, proteins, and flavors and odors.

Four chemists with the help of a fishery aid are concentrating on the development of United States Standards for Grades and Specifications for fishery products.

Recognizing that improved quality results in increased sales and that improved handling results in decreased costs, the Preservation and Engineering group are working to improve the quality of fishery products through all phases of handling--from the time the fish is caught until the finished product reaches the consumer. At the present time, preservation studies are being conducted on the time-temperature tolerance of frozen fishery products and on new methods of chilling and freezing

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 ABSTRACTER: Kathryn L. Osterhaug

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killing of the whale and preparation of the meal. In addition, whalemeat meal contained a fair quantity of B-complex vitamins, was slightly below average for pantothenic acid, was satisfactory for the remaining vitamins, and was rich in nicotinic acid and choline. The length of post-mortem time before preparation did not appear to influence the vitamin-B content of the meals. The amounts of essential amino-acid in each of the seven whalemeat meals are tabulated below. The protein from whalemeat meal can be used to overcome the lysine and threonine deficiency of wheat protein.

Essential amino-acid content calculated as percent of the protein in whalemeat meals based on 16 percent nitrogen

Essential amino acid	Meal 1	Meal 2	Meal 3	Meal 4	Meal 5	Meal 6	Meal 7	Overall average
Arginine	5.65	4.72	4.94	4.24	3.97	5.75	5.45	4.96
Histidine	2.75	1.88	2.03	2.21	2.10	2.31	2.66	2.28
Lysine	7.89	7.09	6.70	8.10	7.14	6.83	7.38	7.30
Tyrosine	2.60	2.49	1.98	2.40	1.87	2.26	2.63	2.32
Tryptophan	1.14	0.99	1.01	0.95	0.88	1.03	1.15	1.02
Phenylalanine	3.65	4.47	5.37	4.78	5.34	3.39	3.81	4.40
Cystine	0.56	1.08	1.12	1.00	0.93	0.59	0.68	0.85
Methionine	1.57	1.58	1.10	1.38	2.29	1.71	2.06	1.67
Threonine	6.93	7.44	5.69	6.80	6.90	5.59	6.03	6.48
Leucine	6.86	7.79	7.32	7.25	8.64	6.35	9.00	7.60
Isoleucine	4.96					5.03	5.44	5.14
Valine	2.72	2.80	2.73	2.83	2.82	2.62	2.91	2.78

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fish at sea and ashore. The time-temperature-tolerance project is concerned with investigations of the effects of various combinations of temperature, storage time, relative humidity in the storage room, and other factors experienced during distribution on the quality of fishery products. In addition, frozen-storage studies are being conducted on new products from presently underutilized species of fish as a means of establishing new markets for such products. This group is also investigating methods of chilling groundfish in refrigerated sea water as a possible method for extending the edible shelf life of these fish, to provide more efficient handling, and to level out production.

Engineering projects at the laboratory include the design of refrigerated sea-water installations for use at the processing plant or aboard a fishing vessel, studies on the freezing of fishery products, and studies on methods of improving plant and vessel sanitation. These investigations are designed to provide information that will improve the economic position of both vessel and plant operators.

Chemical investigations into the fundamental quality factors of fishery products are the responsibility of the Composition and Utilization group. Problems under investigation include the composition of fish, the chemical constituents of the odor and flavor of fish, and the relation between protein denaturation and textural changes during the frozen storage of fish.

Another responsibility of this laboratory is that of maintaining supervision of the U.S.D.I. Voluntary Inspection and Grading program in the New England Region. A team of some 14 highly trained inspectors sample more than 50 million pounds of fishery products annually, thus helping to assure that the consumer obtains top-quality merchandise. Just about every form of frozen, canned, fresh, raw, cooked, uncooked, and breaded fish and shellfish is inspected at one time or another by this laboratory's inspectors.

7.80

ocean perch was prepared. The present paper presents the data obtained by the above methods of analysis from the packs of ocean perch that were prepared both in 1957 and in 1959.

A search of the literature revealed no data on the day-by-day changes in chemical indices in ocean perch. In the first heavily iced pack prepared in 1957, and in the 1959 pack, fillets were cut daily for freezing and subsequent analysis, whereas in the second 1957 pack, the fillets were usually cut every other day. The heavily iced pack of ocean perch reached Class 1 in 4 days, and could be held for as long as 10 to 12 days, in some cases, and still remain satisfactory on the basis of organoleptic and chemical tests. A significant day-to-day increase did not occur in any of the indices until the fish reached the stage at which they were organoleptically unsuitable for human consumption. By this time most of the indices had increased several-fold. Formic acid did not appear until the fish became Class 2 or decomposed.

The indices obtained from the day-by-day study of progressive decomposition of the first heavily iced 1957 pack are presented graphically. A significant change did not occur in any of the indices until the fish became Class 2 or decomposed. The averages of each of the indices for each organoleptic classification for the two 1957 packs and the one 1959 heavily iced pack also are presented graphically.

Conclusions.--As was the case with cod and haddock, a study of the data from the analyses of packs of ocean perch indicates that volatile acid number, formic and acetic acids, volatile bases, volatile amines, and trimethylamine show a high degree of correlation with organoleptic judgment, whereas succinic acid and alcohol show less correlation.

8.51

The second group of fish, which included anchovies, garfish, and bonito, were found to be especially rich in histidine. The total nitrogen of amino acids, glutamine, and creatine plus creatinine made up most of the nitrogen extractives. Almost half of the extractives in anchovy muscle and garfish and more than half of the extractives in bonito were in the form of histidine.

In the third group of fish, the cartilaginous ganoids, the authors studied the muscles of two forms of sturgeon. The sturgeon were notable for their large content of creatine and creatinine. A study of the extractives of the muscles of sturgeon of different ages showed that the content of amino acids and glutamine decrease as the fish grows, and the amount of carnosine increases.

In the fourth group of fish, the isospodyli, were the salmon and smelt. The characteristic peculiarity of these fish is the presence in their muscles of anserine and histidine. In smelt the content of these compounds is much lower than in salmon, but the content of glycine, glutamine, and α-alanine is greater in smelt than in salmon.

The fifth group of fish consists of Gadidae, of which the cod, navaga, and polar cod were taken in the White Sea and the haddock in the Black Sea. The muscles of these fish contained anserine and β-alanine. An especially large amount of β-alanine was found in the muscle of the cod (220 mg. percent) and the navaga (182 mg. percent). Also, in the muscles of the cod there was a large amount of glutamine (152 mg. percent). The increased content of these substances was evidently determined by the living conditions of the fish inasmuch as this was not found to hold for the muscles of haddock taken from the Black Sea.

In the last group of fishes studied there occurred examples of several families of the percoid fishes: mullet, weevers, sculpins, eelpouts, and sole. In the muscles of all of these fish was found a large amount of glutamine. In the mullet, sculpin, and eelpout, there also was considerable glycine and α-alanine.

0.32 IDENTITY OF M-ACTOMYOSIN FROM AQUEOUS EXTRACT OF THE SQUID MUSCLE WITH THE ACTOMYOSIN-LIKE PROTEIN FROM SALT EXTRACT

Matsumoto, Juichiro J.
Bulletin of the Japanese Society of Scientific Fisheries 25, No. 1, 38-43 (1959) (In English)

Actomyosin-like protein from an aqueous extract and from a salt-extract of squid muscle were found to be identical.

0.321 STUDIES ON THE VISCOSITY OF FISH ACTOMYOSINS I. SOME FUNDAMENTAL PROBLEMS ON THE VISCOSITY OF ACTOMYOSIN

Migita, Masao and Suzuki, Taneko
Bulletin of the Japanese Society of Scientific Fisheries 25, 127-135 (June 1959) (English abstract, figures, and tables)

Some fundamental problems concerning the viscosity of actomyosin were studied by using a tilting viscometer designed by WADA. The velocity gradient of the flow can readily be controlled by changing the position on the supporting plate to which the curved end of the viscometer is fixed. Apparent decrease in viscosity was observed with increasing velocity gradient. Many researchers who work with rabbit and carp also find this to be true.

II. Viscosity change of carp actomyosin solution on storage.--Ibid. 319-329 (August 1959). In the present experiment, stability of carp actomyosin solutions were examined to learn if a stock solution could be used in the viscosity measurement, as in the case of rabbit actomyosin.

0.36 DECOMPOSITION AND FORMATION OF OXALATE IN FISH SKELETAL MUSCLE

Yamada, Kisaku; Suzuki, Taneko; and Tanaka, Mizuho (Seikai Regional Fisheries, Research Labs., Nagasaki)
Chemical Abstracts 54, 3764f (March 10, 1960)

0.36 THE DIFFERENCES IN SOME LABILE CONSTITUENTS AND SOME ENZYMATIC ACTIVITIES BETWEEN THE RED AND THE WHITE MUSCLE

Ogata, Takuro (Okayama University Medical School, Okayama)
Journal of Biochemistry 47, 726-732 (June 1960) (Tokyo, Japan)

White muscle fibers from M. adductor magnus of rabbits contained about 3.7 times as much glycogen and about two times as much creatine phosphate and Δ 7 phosphate as the red muscle fibers from M. soleus of rabbits. Total acid-soluble phosphate was high in white muscle fibers, whereas inorganic phosphate was high in red muscle fibers. The activity of oxidation of succinate and pyruvate was about six times higher in the red muscle fibers than in the white muscle fibers. The activity of anaerobic glycolysis and of adenosine triphosphatase was, respectively, about 1.7 and 3.3 times higher in the white muscle fibers than in the red muscle fibers.

0.5 THE BACTERIOSTATIC ACTION OF BENZOIC AND SALICYLIC ACIDS I. THE EFFECT ON THE OXIDATION OF GLUCOSE AND PYRUVIC ACID BY PROTEUS VULGARIS

Bosund, Ingmar
Acta Chemica Scandinavica 13, 803-813 (1959)

(Abstract of this article appears under 3.12 page 5 - August 1960)

0.5 MICROBIOLOGY OF SHELLFISH. BACTERIOLOGICAL STUDY OF THE NATURAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS)

Colwell, R. R. and Liston, J.
Applied Microbiology 8, 104-109 (March 1960)

(Abstract of this article appears under 2.01 page 3 - August 1960)

0.5 SOME CHARACTERISTICS OF A PROTEOLYTIC SYSTEM OF A MARINE BACTERIAL SPECIES

Prescott, J. M. and Willms, Charles R. (Texas Agr. Expt. Sta., College Station)
Chemical Abstracts 54, 13252g (July 10, 1960)

1.12 IDENTIFICATION OF THE PINK PIGMENT OF CANNED TUNA

Brown, W. Duane and Tappel, A. L.
Food Research 22, 214-221 (March-April 1957)

(Abstract of this article appears under 3.331 page 7 - November 1957)

1.12 TUNA INDUSTRY

Anonymous
Fish and Wildlife Circular 87, 7 pp. (June 1960) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.)

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
Thread		Clupea pallasii (Pacific)
		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
Stone		Cancer species (California)
		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
Ocean quahog		Venus mortoni (Florida)
Pismo		Cyprina islandica
		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
Sea		Pecten aequisulcatus (Pacific)
		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

1.81 USE OF PLASTIC SHEETS FOR CONVERSION OF SOFT MUDDY BOTTOMS INTO OYSTER BEDS

Loosanoff, V. L.
Commercial Fisheries Review 21, 45-47 (November 1959)

(Abstract of this article appears under 9.16 page 17 - March 1960)

1.81 MICROBIOLOGY OF SHELLFISH BACTERIOLOGICAL STUDY OF THE NATURAL FLORA OF PACIFIC OYSTERS (CRASSOSTREA GIGAS)

Colwell, R. R. and Liston, J.
Applied Microbiology 8, 104-109 (March 1960)

(Abstract of this article appears under 2.01 page 3 - August 1960)

1.81 CULTURE, HANDLING, AND PROCESSING OF PACIFIC COAST OYSTERS

McKee, Lynne G. and Nelson, Richard W. (Bureau of Commercial Fisheries, Seattle 2, Washington) Fishery Leaflet 498, 21 pp. (April 1960) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.)

This report gives historical background; method of growing native and Pacific oysters; method of transporting, opening, washing, grading, and packing fresh oysters; method of processing frozen oysters; method of processing canned oysters and oyster products; and general state regulations governing the Pacific oyster industry.

2.1120 HYDRODYNAMIC STUDIES ON THE RESISTANCE OF SPHERICAL GLASS FLOATS FOR FISHING NET I. COMPARISON OF THE DRAG COEFFICIENTS OF THE FLOATS HAVING VARIOUS COVERINGS AND DIAMETERS WITH THAT OF THE SPHERE

Taniguchi, Takeo
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 11, 696-699 (1958) (English abstract, figures, and tables)

The resistance of floats used for the Japanese trawl, the otter trawl, and the trap nets were measured experimentally, and their resistance was compared with that of spherical floats and floats without shelter netting covers.

2.1122 MECHANICAL CHARACTERISTICS OF PLATE DEPRESSORS FOR TROLLING

Isouti, Noboru and Kawakami, Tasae
Bulletin of the Japanese Society of Scientific Fisheries 23, Nos. 7 and 8, 354-357 (1957) (In English)

A series of experiments with plate depressors have been carried out in a water tank with the purpose of determining the mechanical characteristics of trolling depressors.

3.10 PRESERVATION OF FRESH FISH

Tarr, H. L. A.
Studies 1958 from Stations of the Fisheries Research Board of Canada, FRB 524 (1959)

(Abstract of this article appears under 2.00 page 1 - April 1960)

3.11 AVAILABILITY OF HINOKITIOL FOR THE PRESERVATION OF FISH

Noguchi, Eizaburo and Yamamoto, Joji
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 524-530 (1958) (English abstract and tables)

The authors measured the improvement in keeping quality in fish treated with hinokitiol (m-isopropyl tropolon), sodium hinokitiolate, and oil of Thujopsis dolabrata. The freshness of fish previously treated by being immersed in 0.01 percent or 0.02 percent solution of hinokitiol for about 1 or 2 hours, was maintained two or three times longer than the controls.

3.12 THE COOPERATION OF SOME LEGALIZED (JAPAN) ANTISEPTICS IN THEIR PRESERVATIVE APPLICATION TO FISH CAKES

Goda, Megumu and Isa, Yoshinobu
Bulletin of the Japanese Society of Scientific Fisheries 25, 525-530 (November 1959) (English abstract, tables, and figures)

The storage life of fish cakes can be lengthened by the addition of 0.001 ~0.002 percent of N. F., a mixture containing 3-(5-nitrofuryl) acrylamide and nitrofurazone in a ratio of 4 : 1, to the raw flesh. N. F. plus 1 percent sorbic acid increased the storage life of the fish cakes more than did the use of either chemical above.

3.12 THE SOFTENING SPOILAGE OF FISH SAUSAGE V. EFFECT OF SODIUM PYROPHOSPHATE AND SORBIC ACID ON THE GROWTH OF SPORE OF BACILLUS CIRCULANS

Uchiyama, Hitoshi and Amano, Keishi
Bulletin of the Japanese Society of Scientific Fisheries 25, 531-544, (November 1959) (English abstract, plates, figures, and tables)

Sodium pyrophosphate and sorbic acid appear to inhibit growth and cell division rather than germination of the spores of Bacillus circulans.

CONVERSION UNITS

1 pound = 453.59 grams

1 ounce = 28.350 grams

1 inch = 2.5400 centimeters

1 gallon = 128 ounces

1 gallon = 231 cubic inches

1 quart = 0.9463 liters

1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F-32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie ..... heat required to raise the temperature of 1 gram of water 1 degree Centigrade

British thermal unit ..... 252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit

ton of refrigeration ..... removal of heat at the rate of 12,000 B.t.u. per hour

atmospheric pressure .... a normal ..... a pressure at sea level of 14.696 pounds per square inch, absolute

sensible heat ..... heat added to the body when its temperature is changed

latent heat ..... heat absorbed or evolved during a change of state, with no change of temperature

heat of fusion ..... heat absorbed when a solid melts, with no change of temperature

heat of vaporization ..... heat absorbed when a liquid vaporizes, with no change of temperature

heat of reaction ..... heat evolved or absorbed during a chemical reaction

heat transmission ..... flow of heat by conduction, convection, or radiation, singly or in any combination

horsepower ..... work performed at the rate of 550 foot pounds per second

mechanical equivalent of 1 B.t.u. of heat ..... heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Angstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

4.2 THE LIPIDES

Klenk, E. and Debuch, H. (Univ. Cologne, Ger.)
Chemical Abstracts 53, 22140i (November 25, 1959)

4.20 COLORIMETRIC REACTIONS OF UNSATURATED FATTY ACIDS WITH METAL SALTS

Rhodes, D. N.
Journal of Applied Chemistry 10, 122-124 (March 1960)

(Abstract of this article appears under 4.11 page 5 - September 1960)

4.86 POSSIBILITIES OF THE UTILIZATION OF RESIDUES FROM THE MANUFACTURE OF FISH MEAL

Ceamis, M.
Chemical Abstracts 53, 1582a (January 25, 1959)

4.86 USE OF FISH OILS FOR FAT LIQUORING LEATHER III. SUITABILITY OF OCEAN PERCH, HERRING, SALMON, AND MENHADEN OILS IN FATLIQUORING

Mattei, V. and Roddy, W. T.
J. Amer. Leath. Chem. Ass. 54, 640-653 (1959)
Journal of Applied Chemistry 10, 519 (May 1960)

Results using ocean perch, herring, salmon, and menhaden oils in fatliquoring leather were comparable with those obtained using cod oil except that the surface was slightly harder in some cases.

4.92 TOXICITY OF FISH OIL III.

Matsuo, Noboru (Tokyo Med. Coll.)
Chemical Abstracts 53, 11550h (June 25, 1959)

4.92 EFFECT OF FATTY ACIDS ON CHICK ENCEPHALOMALACIA

Century, Bernard and Horwitt, M. K. (Univ. of Illinois, Chicago)
Chemical Abstracts 54, 3621g (March 10, 1960)

4.92 HARMFUL EFFECTS OF HEATED AND OXIDIZED FATS

Karplyuk, I. A. (Central Inst. Graduate Physicians, Moscow)
Chemical Abstracts 54, 13483a (July 10, 1960)

6.15 SUBMERGED EVAPORATION AND ITS APPLICATION TO FISH STICKWATER RECOVERY

Carpenter, G. A.
Chemical Abstracts 53, 12516b (July 10, 1959)

6.15 PRESERVATION OF THE NUTRITIVE VALUE OF CONCENTRATED FISH WATER

Kruss, Johannes Panto-Werk
Chemical Abstracts 54, 13494i (July 10, 1960)

6.15 PROTEIN PREPARATIONS FROM FISH SUITABLE AS FEEDS

Vogel and Co. G. m. b. h. (by Klement Mohler and Raimund Vogel)
Chemical Abstracts 54, 13493i (July 10, 1960)

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American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Archives of Biochemistry & Biophysics
Academic Press, Inc.
Prince & Lemon Streets
Lancaster, Pennsylvania

ASHRAE Journal
American Society of Refrigerating and Air-Conditioning Engineers, Inc.
234 Fifth Avenue
New York 1, New York

California Fish and Game
Editor
Department of Fish and Game
722 Capitol Avenue
Sacramento 14, California

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American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical and Engineering News
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical Engineering
McGraw-Hill Publishing Co.
330 W. 42nd Street
New York, New York

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Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

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Director, Bureau of Commercial Fisheries
Division of Industrial Research and Services
Fish and Wildlife Service
Department of the Interior
Washington 25, D. C.

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Drug Markets, Inc.
101 W. 31st Street
New York, New York

Federation Proceedings
Federation of American Societies for Experimental Biology
9650 Wisconsin Street
Washington 14, D. C.

Feed Bag, The
Editorial Service Company
1712 West St. Paul Avenue
Milwaukee 3, Wisconsin

Feedstuffs
Miller Publishing Co.
118 South 6th Street
Minneapolis 2, Minnesota

Fish Boat, The
H. L. Peace Publications
624 Gravier Street
New Orleans 12, Louisiana

Fishing Gazette
Fishing Gazette Publishing Corp.
461 Eighth Avenue
New York, New York

Food Engineering
McGraw-Hill Publishing Co., Inc.
330 W. 42nd Street
New York 18, New York

Food Processing
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

Food Research
The Garrard Press
510 North Hickory Street
Champaign, Illinois

Food Technology
Institute of Food Technologists
11606 South Bell Avenue
Chicago 43, Illinois

Frosted Food Field
Frosted Food Field, Inc.
19 W. 44th Street
New York 18, New York

Industrial and Engineering Chemistry
American Chemical Society
1155 - 16th Street, N. W.
Washington 6, D. C.

Industrial Refrigeration
Nickerson & Collins Co.
433-435 N. Waller Avenue
Chicago, Illinois

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American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

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American Chemical Society
1155 - 16th Street, N. W.
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Journal of the American Dietetic Association
American Dietetic Association
620 North Michigan Avenue
Chicago 11, Illinois

Journal of the American Oil Chemists' Society
The American Oil Chemists' Society
35 E. Wacker Drive
Chicago 1, Illinois

Journal of the Association of Official Agricultural Chemists
Association of Official Agricultural Chemists
P. O. Box 540
Benjamin Franklin Station
Washington, D. C.

Journal of Biological Chemistry
The American Society of Biological Chemists, Inc.
Mt. Royal & Guilford Avenues
Baltimore, Maryland

Journal of Nutrition
The Wistar Institute of Anatomy & Biology
36th St. at Spruce
Philadelphia 4, Pennsylvania

Journal of Organic Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Maine Coast Fisherman
Maine Coast Fisherman, Inc.
Belfast, Maine

Modern Packaging
Modern Packaging Corporation
575 Madison Avenue
New York 22, New York

National Fisherman
Atlantic Fisherman, Inc.
Goffstown, New Hampshire

National Provisioner
National Provisioner, Inc.
15 W. Huron Street
Chicago 10, Illinois

Nutrition Reviews
Nutrition Foundation, Inc.
99 Park Avenue
New York 16, New York

Pacific Fisherman
Miller Freeman Publishing, Inc.
500 Howard Street
San Francisco 5, California

Poultry Science
Poultry Science Association
Kansas State College
Manhattan, Kansas

Progressive Fish-Culturist
U. S. Department of the Interior
Bureau of Sport Fisheries and Wildlife
Fish and Wildlife Service
Washington 25, D. C.

Quick Frozen Foods
E. W. Williams Publishing, Inc.
82 Wall Street
New York 5, New York

Science
American Association for the Advancement of Science at the Business Press
1515 Massachusetts Avenue, N. W.
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Seafood Merchandising
H. L. Peace Publications
624 Gravier Street
New Orleans 9, Louisiana

Western Canner/Packer
The Canner Publishing Co.
817 West Market Street
Louisville, Kentucky

Western Feed & Seed
Western States Publications
320 Market Street
San Francisco 11, California

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Analyst, The
14 Belgrave Square
London, S. W., 1, England

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Ottawa, Ontario, Canada

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Cambridge University Press
Bentley House
200 Euston Road
London, N. W., 1, England

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Consultants Bureau, Inc.
227 W. 17th Street
New York 11, New York

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c/o Tokyo Suisan Daigaku
Shiba-kaigandori 6-Chome
Tokyo, Japan

Bulletin of the Faculty of Fisheries, Hokkaido University
Faculty of Fisheries
Hokkaido University
Hakadote, Japan

Canadian Fisherman
National Business Publications, Ltd.
Gardenvale, Quebec, Canada

Canadian Journal of Biochemistry & Physiology
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Canadian Journal of Chemical Engineering
The Chemical Institute of Canada
18 Rideau Street
Ottawa 2, Ontario, Canada

Canadian Journal of Chemistry
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Chemistry & Industry
14 Belgrave Square
London, W., 1, England

Fette-Seifen-Anstrichmittel
Industrieverlag von Hernhaussen KG
Hamburg 11, West Germany

Fisheries Newsletter
Commonwealth Director of Fisheries, Department of Primary Industry
Canberra, Australia

Food Manufacture
Leonard Hill, Ltd.
Eden Street
London, N. W., 1, England

Food Preservation Quarterly
Division of Food Preservation and Transport
Commonwealth Scientific and Industrial Research Organization
Sydney, Australia

Journal of Applied Chemistry
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Journal of the Fisheries Research Board of Canada
University of Toronto Press
Ottawa, Ontario, Canada

Journal of the Science of Food and Agriculture
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Modern Refrigeration
Maclaren House
131 Great Suffolk Street
London, S. E., 1, England

Nature
MacMillan & Co., Ltd.
St. Martin's Street
London, W. C., 2, England

Norwegian Fishing News
Kaigaten 8
P. O. Box 222
Bergen, Norway

Progress Reports of Atlantic Coast Stations
Fisheries Research Board of Can.
St. Andrews, New Brunswick, Can.

Progress Reports of Pacific Coast Stations
Technological Station
898 Richards Street
Vancouver 2, B. C., Canada

Report of the Food Investigation Board (Great Britain)
Department of Scientific and Industrial Research
Charles House
5-11 Regent Street
London, S. W., 1, England

Trade News
Director of Information and Educational Service
Department of Fisheries
Ottawa, Ontario, Canada

Western Fisheries
Roy Wrigley Publications, Ltd.
1104 Hornby Street
Vancouver 1, B. C., Canada

World Fisheries Abstracts
FAO Fisheries Division
Technology Branch
Viale delle Terme di Caracalla
Rome, Italy

World Fishing
John Trundell, Ltd.
St. Richards House
Eversholt Street
London, N. W., 1, England

6.71 STUDIES ON THE PROTEINASE OF PYLORIC CAECA I. PREPARATION OF CRYSTALLINE PROTEINASE OF TUNNY PYLORIC CAECA

Togasawa, Yoshihisa and Katsumata, Teizo
Bulletin of the Japanese Society of Scientific Fisheries 25, 122-126 (June 1959) (English abstract, figures, and tables)

Purification of the proteinase of tunny pyloric caeca was carried out by extracting the ground material with distilled water, salting-out with ammonium sulphate, dialysis, rivanol treatment for removal of amylase, fuller's earth treatment, and precipitation and crystallization with acetone. Crystals of proteinase were obtained in the form of needles with a yield of 1.5 percent and a specific activity that was increased 20.6 times as compared with the original solution.

II. Preparation of crystalline proteinase of tunny pyloric caeca by ion exchange resin. --Ibid. 402-407 (September 1959). The proteinase of tuna pyloric caeca was purified with Amberlite XE-64 and chromatographed on a column with Amberlite IRC-50 as in the preliminary experiments. Crystalline proteinase was prepared by distilled water extraction of ground pyloric caeca, adsorption of enzyme with Amberlite XE-64, elution of proteinase after washing the resin for removal of amylase, salting-out with ammonium sulphate, dialysis, precipitation and crystallization with acetone.

III. Preparation of crystalline proteinase of bonito pyloric caeca. --Ibid. 470-472 (October 1959). Decolorization with Duolite A-2 was included as an added operation in the purification of the proteinase of bonito pyloric caeca just prior to precipitation and crystallization of the proteinase.

7.51 COMPARATIVE STUDIES ON TWO HEMOGLOBINS OF SALMON II. CRYSTALLIZATION AND SOME PHYSICAL PROPERTIES

Hashimoto, Kanehisa and Matsuura, Fumio
Bulletin of the Japanese Society of Scientific Fisheries 25, 465-469 (October 1959) (In English)

Components F and S of salmon hemoglobin were successfully crystallized from a hemolyzate by fractional crystallization. Electrophoretical, ultracentrifugal, diffusion, and heat-coagulation analyses showed that components F and S were practically identical. Component F and S were found to differ from one another in sedimentation and diffusion constants, and frictional ratio, but not in molecular weight.

7.51 PERFORMIC ACID OXIDATION OF FISH INSULIN

Honma, Terutake (Shimizu Pharmaceutical Co., Ltd., Shimizu, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 26, 136 (February 1960) (English abstract, tables, and figure)

7.61 DETERMINATION OF VITAMIN A

Embree, Norris D.; Ames, Stanley R.; Lehmann, Robert W.; and Harris, Philip L. (Distillation Prod. Inds., Rochester, N. Y.)
Chemical Abstracts 51, 9778 (July 10, 1957)

7.614 BIOLOGICAL AVAILABILITY OF VITAMIN A

Hochberg, Melvin (Nopoc Chemical Co., Harrison, New Jersey)
Feedstuffs 30, 18-20 (February 8, 1958)

Procedures are described for the quantitative measurement of the biological activity of vitamin A by employing growth, feed efficiency, occurrence of deficiency symptoms, mortality, and liver storage as the criteria.

7.7 PLASTIC MODELS ARE REPLACING COLOR GRADING CHARTS

Ingle, George W. (Monsanto Chemical Co.)
Food Packer 38, 19, 42 (August 1957)

7.74 POLAROGRAPHIC DETERMINATION OF TIN IN FOODS

Markland, J. and Shenton, F. C.
Analyst 82, 43-45 (January 1957)

(Abstract of this article appears under 7.42 page 15 - July 1957)

7.77 APPLICATION OF CATION-EXCHANGE RESIN TO THE DETERMINATION OF ACETYL VALUE OF FISH OIL

Suzuki, Kosaku (Tokyo Univ. Fisheries, Numazu)
Chemical Abstracts 53, 12516d (July 10, 1959)

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8.40 BIOCHEMICAL STUDIES ON THE VISCERA OF CUTTLEFISH OMMASTREPHES SLOANI PACIFICUS I. CONTENTS OF INORGANIC SUBSTANCES IN VISCERA

Takahashi, Takashi
Bulletin of the Japanese Society of Scientific Fisheries 25, No. 1, 44-47 (1959) (English abstract and tables)

The cationic elements: Cu, Fe, Al, Zn, Mn, Mg, Ca, Na, and K-, and the anionic elements: Cl, P, S, and I were determined qualitatively in cuttlefish viscera. A trace of cadium also was found. The quantity of Zn, Mn, and Cu in the viscera of cuttlefish was greater than in fish meat and mollusc meat.

8.51 BIOCHEMICAL STUDIES ON VISCERA OF CUTTLEFISH (OMMASTREPHES SLOANI PACIFICUS) II. ON THE NITROGENOUS COMPOUNDS IN HOT WATER EXTRACT OF LIVER

Takahashi, Takashi
Bulletin of the Japanese Society of Scientific Fisheries 25, 193-195 (July 1959) (English abstract)

The following free amino acids were detected in the extract: cystine, serine, glutamic acid, tyrosine, lysine, histidine, arginine, proline, leucine, valine, aspartic acid, glycine, and alanine.

8.6 NUTRITIONAL VALUES AND VITAMINS OF NORWEGIAN FISH AND FISHPRODUCTS

Taarland, Torleiv and Mathiesen, Erling (Hermetik-kindustriens Laboratorium); and Braekkan, Olaf R. (Vitaminlaboratoriet, Fiskeridirektoratets Kjemisk-Tekniske Forskningsinstitutt)
Saertrykk av Tidsskrift for Hermetikkindustri NR. 11, pp. 405-412 (1958) (Stavanger, Norway)

8.61 EVALUATION OF THE PROPOSED (ANRC) VITAMIN A REFERENCE STANDARD

Ames, Stanley R. (Distillation Products Industries, Rochester, New York)
Feedstuffs 32, 38-40 (March 3, 1960)

The proposed Animal Nutrition Research Council (ANRC) vitamin-A reference standard is of high purity, can be easily analyzed by chemical procedures, is reasonably stable when mixed in feeds, and corresponds very well with the present United States Pharmacopoeia vitamin-A reference solution. Since it consists of all-trans-vitamin A, it has a known content of biologically active isomers, which have been demonstrated by bioassay. Adoption as the ANRC vitamin-A reference standard is recommended.

8.610 VITAMIN A AND CAROTENOIDS IN CERTAIN INVERTEBRATES VI. CRUSTACEA: PENAEIDEA

Fisher, L. R.; Kon, S. K.; and Thompson, S. Y. (Natl. Inst. for Research in Dairying, Shinfield, England)
Chemical Abstracts 52, 4872 (March 25, 1958)

8.610 CAROTENOID CONTENT OF SOME FRESH-WATER CRUSTACEANS

Farkas, Tibor
Chemical Abstracts 53, 22550f (November 25, 1959)

8.6177 SHARK-LIVER OIL. I. PHYSICOCHEMICAL CONSTANT AND VITAMIN A CONTENT OF LIVER OIL FROM SHARKS OF THE KARACHI COAST

Ali, S. Masqsood; Haq, S. Abdul; and Mahdihassan, S. (Pakistan Council Sci. and Ind. Research, Karachi)
Chemical Abstracts 52, 14083 (August 25, 1958)

9.16 FISH CULTURE ON PADDY FIELDS IN INDONESIA

Ardiwinata, R. Odjoh (Inland Fisheries Research Institute, Djakarta, Indonesia)
Indo-Pacific Fisheries Council Proceedings, 7th Session, Bandung, Indonesia, May 13-27, 1957, Sections II and III, pp. 119-162 (1958) (Bangkok) (FAO)

9.16 OPTIMUM OYSTER PRODUCTION OFFERED BY POND FARMS THROUGH BETTER CONTROL

Anonymous
National Fisherman 41, 7-8 (February 1960)

George Staples of Crisfield, Maryland, lists the advantages of growing oysters in ponds as increased production per acre, faster growth rates, more efficient spawning and setting, and easier control of predators, parasites, diseases, and competitors. Research is needed to develop this experimental method of culture.

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